

No.

200100041



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Wisconsin Alumni Research Foundation

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED DISTINCT VARIETY OF SEXUALLY REPRODUCED, OR TUBER PROPAGATED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF TWENTY YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR SELLING IT, OR EXPORTING IT, OR CONDITIONING IT FOR PROPAGATION, OR STOCKING IT FOR ANY OF THE FOREGOING PURPOSES, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

POTATO

'Millennium Russet'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this twenty-seventh day of September, in the year two thousand and seven.

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

200/00041

Form Approved - OMB No. 0581-0055

REPRODUCE LOCALLY. Include form number and date on all reproductions

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER Wisconsin Alumni Research Foundation		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME W1348	3. VARIETY NAME 'Millennium Russet'
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code, and Country) 614 North Walnut Street P.O. Box 7365 Madison, WI 53707-7365		5. TELEPHONE (include area code) (608) 263-2500	FOR OFFICIAL USE ONLY PVPO NUMBER 200/00041 FILING DATE 12/13/00
		6. FAX (include area code) (608) 263-1064	
7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION (corporation, partnership, association, etc.) Corporation	8. IF INCORPORATED, GIVE STATE OF INCORPORATION Wisconsin	9. DATE OF INCORPORATION 9-14-25	
10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. (First person listed will receive all papers) Lisa Mueller Dykema Gossett PLLC 10 South Wacker Drive, Suite 2300 Chicago IL 60606			FILING AND EXAMINATION FEES: \$ 2450.00 DATE 12/13/00 CERTIFICATION FEE: \$ 768.00 DATE 6/25/07
11. TELEPHONE (include area code) 312-627-2184	12. FAX (include area code) 312-876-1155	13. E-MAIL lmueller@dykema.com	14. CROP KIND (Common Name) potato
15. GENUS AND SPECIES NAME OF CROP Solanum tuberosum L.		16. FAMILY NAME (Botanical) Solanaceae	17. IS THE VARIETY A FIRST GENERATION HYBRID? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
18. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow instructions on reverse) a. <input checked="" type="checkbox"/> Exhibit A. Origin and Breeding History of the Variety b. <input checked="" type="checkbox"/> Exhibit B. Statement of Distinctness c. <input checked="" type="checkbox"/> Exhibit C. Objective Description of Variety d. <input checked="" type="checkbox"/> Exhibit D. Additional Description of the Variety (Optional) e. <input checked="" type="checkbox"/> Exhibit E. Statement of the Basis of the Owner's Ownership f. <input type="checkbox"/> Voucher Sample (2,500 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository) g. <input checked="" type="checkbox"/> Filing and Examination Fee (\$2,450), made payable to "Treasurer of the United States" (Mail to the Plant Variety Protection Office)		19. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? See Section 83(a) of the Plant Variety Protection Act. <input type="checkbox"/> YES (If "yes", answer items 20 and 21 below) <input checked="" type="checkbox"/> NO (If "no," go to item 22) 20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO 21. IF "YES" TO ITEM 20, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? <input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED	
22. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. (Please use space indicated on reverse.)		23. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT (PLANT BREEDER'S RIGHT OR PATENT)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. (Please use space indicated on reverse.)	
4. The owners declare that a viable sample of basic seed of the variety will be furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate. The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Owner(s) is(are) informed that false representation herein can jeopardize protection and result in penalties.			
SIGNATURE OF OWNER Lisa V Mueller		SIGNATURE OF OWNER	
NAME (Please print or type) Lisa V. Mueller		NAME (Please print or type)	
CAPACITY OR TITLE Attorney	DATE 12-12-00	CAPACITY OR TITLE	DATE

INSTRUCTIONS

GENERAL: To be effectively filed with the Plant Variety Protection Office (PVPO), ALL of the following items must be received in the PVPO: (1) Completed application form signed by the owner; (2) completed Exhibits A, B, C, E; (3) at least 2,500 viable untreated seeds, or for tuber reproduced varieties verification that a viable *(in the sense that it will reproduce an entire plant)* tissue culture will be deposited and maintained in a public repository prior to issuance of a certificate; (4) check drawn on a U.S. bank for \$2,450 (\$300 filing fee and \$2,150 examination fee), payable to "Treasurer of the United States" (See Section 97.175 of the Regulations and Rules of Practice.) Partial applications will be held in the PVPO for not more than 30 days, then returned to the applicant as unfiled. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 500, NAL Building, 10301 Baltimore Blvd., Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. DO NOT use masking materials to make corrections. If a certificate is allowed, you will be requested to send a check payable to "Treasurer of the United States" in the amount of \$300 for issuance of the Certificate.

Plant Variety Protection Office
Telephone: (301) 504-5518

#200100041

ITEM

- 16a. Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
- (2) the details of subsequent stages of selection and multiplication;
- (3) evidence of uniformity and stability; and
- (4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified.
- 16b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:
- (1) identify these varieties and state all differences objectively;
- (2) attach statistical data for characters expressed numerically and demonstrate that these are clear differences;
- (3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.
- 16c. Exhibit C forms are available from the PVPO for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.
- 16d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, etc.
- 16e. Section 52(4) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. The applicant may be the actual breeder, the employee of the breeder, the owner through purchase or inheritance, etc.
17. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant may NOT reverse this affirmative decision after the variety has been sold and so labelled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See P.L. 103-349 for additional information.)*
20. See Sections 41, 42, and 43 of the Act and Section 97.175 of the regulations for eligibility requirements.

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment during the life of the application/certificate. There is no charge for filing a change of address. The fee for filing a change of ownership or assignment is specified in Section 97.175 of the regulations. *(See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of Regulations and Rules of Practice.)*

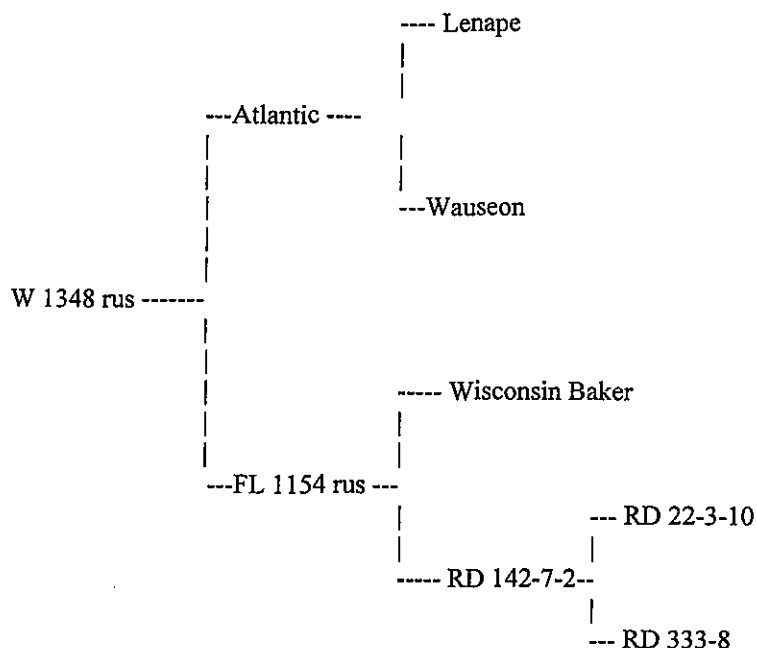
To avoid conflict with other variety names in use, the applicant should check the variety names proposed by contacting: Seed Branch, AMS, USDA, Room 213, Building 306, Beltsville Agricultural Research Center-East, Beltsville, MD 20705. Telephone: (301) 504-8089.

Public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Agriculture, Clearance Officer, OIRM, AG Box 7630, Washington, DC 20250; and to the Office of Management and Budget, Paperwork Reduction Project (OMB No. 0581-0055), Washington, DC 20503.

Exhibit A
Origin and Breeding History of the Variety W 1348 rus.

1. Genealogy and breeding.

1a. Genealogy.



1b. Breeding Method.

As seen at 1a, the cross was made between a commercial variety, Atlantic and a breeding line, FL 1154 rus. A conventional breeding scheme based on individual clonal selection in generation F1 was used. The main selection criterion was to obtain a variety with long, russet skinned, white fleshed potatoes, which produces good size tubers for fresh market and for French fries, with a higher yield and specific gravity than Russet Burbank and more adapted to the Wisconsin environmental conditions.

2. Subsequent Stages of Selection and Multiplication.

The cross was made in 1988 at Rhinelander Agricultural Research Station. In 1989 the clone was in the seedling stage, in 1990 in Single Hill Plots, in 1991 in 4 Hill Plots, in 1992 in 8 Hill Plots, in 1993 in 20 Hill Plots, in 1994 in 40 Hill Plots, in 1995 in observation trial in Hancock and in replicated trial in Rhinelander, in 1996-1998 in replicated trials in Hancock and Rhinelander 1991-1995, in 1997-1999 in North Central Regional Trial, in 1996-1999 in Wisconsin State Trial. In 1998 was multiplied under certification by Bula Potato Farms, Gallenberg Farms, Golden Acres Potato Ranch, Seidl Farms and Bushman's Riverside Ranch in Wisconsin and in 1999 was multiplied by Bula Potato Farms, Gallenberg Farms, Golden Acres Potato Ranch and Seidl Farms.

3. Evidence of Uniformity and Stability.

The genetic structure is highly uniform due to the vegetative propagation of the potato plants. The phenotypic expression can vary in function of the interaction between genotype and environment and therefore the following statements are made.

3a. Uniformity.

The tuber appearance is uniform in shape, depth of eyes, russet skin and white flesh. In some years the tuber shape can be pointed or dumbbel-like, as it happens in other current russet varieties, including Russet Burbank.

3b. Stability.

Along the breeding stages in 1989-1994 and the replicated trials in 1995-1999, W 1348 rus proved to be stable in the tuber appearance, with exception of cases of diseases and physiological disorders.

4. The Type and Frequency of Variants during reproduction and Multiplication.

The potato line W 1348 rus is multiplied vegetatively, which keeps the genotypic structure unaltered. The frequency of natural mutations for tuber skin color, for maturity and foliage type is very likely less than 1 in 100,000 and the regular potato seed production systems do clonal selection discarding any variant which is not true to type (for instance the tolerances of Wisconsin Potato Seed Certification Program is 0.00% for Foundation and 0.1% for Certified categories).

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DRAFT Exhibit A Form

<p>1. Describe the genealogy (back to and including public and commercial varieties, lines, or clones used) and the breeding method(s).</p> <p>See originally filed Exhibit A (Filed 12-12-00), namely, items 1a & 1b, entitled "Genealogy and Breeding" and "Breeding Method"</p>								
<p>2. Give the details of subsequent stages of selection and multiplication.</p> <table border="1"> <thead> <tr> <th>Year</th> <th>Detail of Stage</th> <th>Selection Criteria</th> </tr> </thead> <tbody> <tr> <td></td> <td>See originally filed Exhibit A (filed 12-12-00) namely item 2, entitled "Subsequent Stages of Selection and Multiplication".</td> <td></td> </tr> </tbody> </table>			Year	Detail of Stage	Selection Criteria		See originally filed Exhibit A (filed 12-12-00) namely item 2, entitled "Subsequent Stages of Selection and Multiplication".	
Year	Detail of Stage	Selection Criteria						
	See originally filed Exhibit A (filed 12-12-00) namely item 2, entitled "Subsequent Stages of Selection and Multiplication".							
<p>3a. Is the variety uniform? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>How did you test for uniformity?</p> <p>Via visual observation during the breeding stages and replicated trials.</p>								
<p>3b. Is the variety stable? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>How did you test for stability? Over how many generations?</p> <p>Via visual observation during the breeding stages (6 generations - 1989-1994) and replicated trials (5 generations - 1995-1999), a total of 11 generations.</p>								
<p>4. Are genetic variants observed or expected during reproduction and multiplication? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p>If yes, state how these variants may be identified, their type and frequency.</p> <p>As discussed in originally filed Exhibit A (filed 12-12-00), item 4, potato line W1348 rus is vegetatively propagated, which keeps the variety uniform and stable. The frequency of natural mutations for tube-skin color, for maturity and foliage type is very likely less than 1 in 100,000.</p>								

Continue on additional pages if necessary.

Exhibit B

Name of the most similar variety: 'Russet Burbank'

1. **Fry Color From Cold Storage.**

Fry color from cold storage is a trait that is of great interest to the industry. In that regard, Applicant has found that the fry color of 'Millennium Russet' to be lighter than the color 'Russet Burbank' when grown and fried directly from cold storage or after being reconditioned for a period of time at room temperature. Data supporting this finding is provided below.

In a first experiment, the chip color of 'Millennium Russet' and 'Russet Burbank' were examined using an Agstron Model M-35 Process Analyzer after the chips were stored at 10°C, 7.2°C, 3.3°C or after being reconditioned. The experimental design and results are provided below.

Table A: Data From Porter et al., 2002 (a copy of which is enclosed).

Storage condition	'Millennium Russet'	'Russet Burbank'	Waller-Duncan LSD
10°C	64	59	3
7.2°C	58	52	4
3.3°C	39	26	3
Reconditioned	51	37	9

Note that in every case chips of W1348 rus were significantly lighter (significantly higher Agtron M35 values).

Experimental Procedure:

Experimental design: location: Presque Isle, ME. Year: 2000. Statistical design: randomized complete block design with four replications. Significance between the mean of the varieties were performed by the Waller-Duncan LSD test. Planting date: May 17, Vine dissection: Sept 13, Harvest: Sept 29. Chip color evaluated February 8. Chips were fried at 350°C for three minutes and chip color scores are from an Agstron Model M-35 Process Analyzer (Agstron, Inc., Sparks, Nevada; calibrated with a black disk "0" = 0, and white disk "90" = 90). Chips were crushed and reported values are means from four replicate samples. Each sample was read three times and was thoroughly mixed between readings. Reconditioned samples were taken from 3.3°C. Larger values equal lighter chips.

In the second experiment, the frying ability of 'Millennium Russet' and 'Russet Burbank' were compared using potatoes grown in different locations, stored at different temperatures and for different lengths of time and then fried under different conditions. The experimental design and results are provided below.

Experimental Procedure:

The field experimental design in each case included plot sizes of 6.1m containing single rows of plants separated 0.30m within and 0.91m among rows in a randomized complete block design with three replications. Five randomly selected potatoes were fried from samples of each plots stored at 5.5°C for one, three or six months. Direct frying indicates samples that were fried immediately after coming out of storage, reconditioned indicates that samples were kept at 5.5°C and then taken out of the storage and put at room temperature for a period of two weeks prior to frying to revert the accumulation of reducing sugars (glucose and fructose to starch). Reconditioned* means that frying occurred after at least one day of reversion at room temperature. Chips were fried at 350°C for three minutes using a Hotpoint™ HK3 model (General Electric, Chicago Heights, IL). Store time indicates the amount of time in storage after harvest for the different temperature regimes. Chip color scores A visual 1-10 scoring scale was used where 1=very light chip color and 10=very dark chip color. Analyses of variance for the cultivars were calculated by SAS proc mixed and the LSD around the mean were obtained from the confidence intervals around the best linear unbiased predictors of the mean performance of the cultivars, and the results given in the Table B below.

Table B Frying ability of 'Millennium Russet' vs. 'Russet Burbank' at different frying and cold storage regimes in Wisconsin.

Year	Location	Store Temp	Store Time	Frying Condition	'Millennium Russet'	'Russet Burbank'	LSD
1997	Rhineland	5.5°C	3 mo	Direct	6.8	9.7	1.2
1997	Rhineland	5.5°C	3 mo	Reconditioned	6.3	7.5	1.0
1997	Hancock	15.5°C	1 mo	Direct	4.9	5.3	0.3
1997	Hancock	5.5°C	3 mo	Direct	7.9	9.4	1.1
1997	Hancock	5.5°C	6 mo	Direct	5.6	9.0	0.9
1997	Hancock	5.5°C	6 mo	Reconditioned	5.9	8.9	1.4
1997	Antigo/Hancock	4.4°C	3 mo	Direct	7.0	9.4	1.4
1997	Antigo/Hancock	4.4°C	3 mo	Reconditioned	5.5	7.7	1.1
1998	Hancock	5.5°C	3 mo	Reconditioned	8.1	9.1	1.0
1998	Hancock/Spooner	4.4°C	3 mo	Reconditioned *	8.5	9.4	0.8
1999	Hancock	4.4°C	6 mo	Reconditioned *	7.9	8.7	1.3

Note: In 10 out of 11 experiments conducted in WI chips of 'Millennium Russet' were significantly lighter than chips of 'Russet Burbank'.

2. **Corolla Color** : Difference in Corolla Shape and Color between 'Millennium Russet' and 'Russet Burbank'

Flowers of ^{Pentagonal} ~~rotate~~ shape and purple color of 'Millennium Russet' (Corolla color: purple (5 RP 8/4 Munsell Color Chart) vs. flowers of stellate shape and white color of 'Russet Burbank' (Coppes Color Chart) on card stock are enclosed herewith).

Sources of Pictures: 'Millennium Russet' photo contributed by H. Groza and published as Fig. 2c in Groza et al, *Amer. J. of Potato Res*, 82:211-219 (2005), page 213 (A copy of which was included in the last response). The 'Russet Burbank' photo published in the Canadian Food

per mail
March 14, 2007

LMC
5-31-07

#200100041

Inspection Agency website shown below:

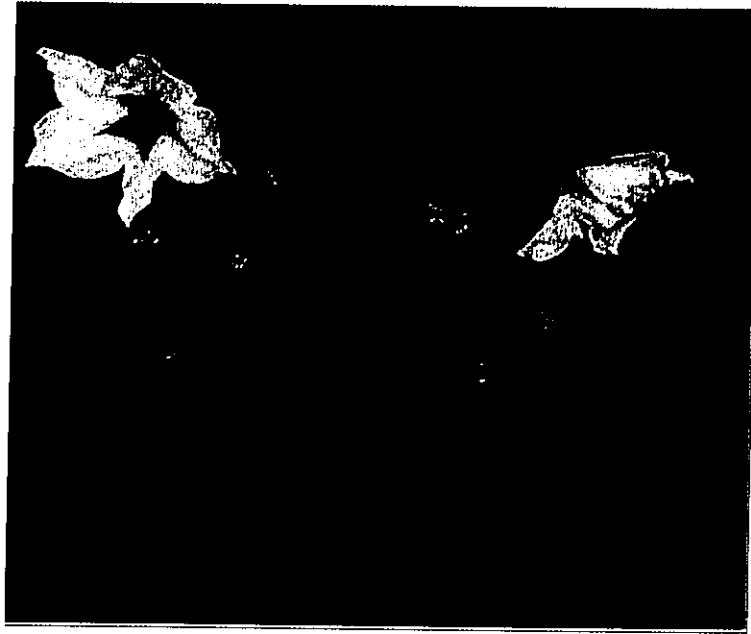
<http://www.inspection.gc.ca/english/plaveg/potpom/var/russetburbank/russetbe.shtml>

#200100041



'Millennium Russet'

#200100041



'Russet Burbank'

Supplemental Exhibit B

Based on overall morphology and commercial use, W1348 rus is most similar to Russet Burbank. W1348 rus most clearly differs from Russet Burbank in the following traits:

1. Market Yield (namely, US #1 Tuber Yield in tons per hectare).

In the North Central Regional Trial, which included data from Alberta, Manitoba, Michigan, Minnesota, Nebraska, Ontario and Wisconsin (all irrigated) as well as from Iowa, North Dakota and Ohio (dry land)), the marketable yield of W1348 was higher than Russet Burbank as illustrated below:

No. of Tests	Test Year	W1348 rus	Russet Norkotah	Russet Burbank	Difference From Russet Norkotah	Difference From Russet Burbank
7	1997	23.8	19.6	17.6	+4.2	+6.2
8	1998	29.7	34.0	24.9	-4.3	+4.8
10	1999	26.3	21.6	23.5	+4.7	+2.8

2. Percentage of Tubers Free from External Defects.

The percentage of tubers free from internal defects (green, second growth, growth cracks, scab, tuber rot) of W 1348 rus was superior to the standard Russet Burbank in the North Central Regional Trial as seen in the below two-year data (Michigan, Minnesota, Nebraska and Wisconsin on irrigated land, and Iowa, North Dakota and Ohio on dry land, in 1997; Alberta, Manitoba, Michigan, Minnesota, Nebraska and Wisconsin on irrigated land, and North Dakota and Ohio on dry land in 1998).

Number of Tests	Year	W 1348 rus	Russet Burbank	Russet Norkotah
7	1997	82.7	60.7	94.3
8	1998	87.0	43.0	86.5

3. Percentage of Tubers Free from Internal Defects.

The percentage of W1348 rus tubers free of internal defects (hollow heart, brown spot and vascular discoloration) was 89% in 1997 and 94% in 1998 in the North Central Regional Trials (see above) versus 79% and 94%, respectively for Russet Burbank. In the two-year trials conducted in Columbia River Basin, 100% of W1348 tubers of greater than 12 oz (340.2 g) were free of internal defects versus 82.7% in Russet Burbank (See Thornton and Knowles, Potato Cultivar Yield and Post Harvest Quality Evaluations, Washington State University, 2000, 2001)*.

4. Specific Gravity.

Specific gravity was consistently higher in W1348 rus than in Russet Norkotah and Russet Burbank in the North Central Regional Trial (see the table below) and averaged 1.091 for W1348 (versus 1.080 in Russet Burbank) over 3 years (1999-2001) in the Columbia Basin (See Thornton and Knowles, Potato Cultivar Yield and Post Harvest Quality Evaluations, Washington State University, 1999, 2000, 2001)*.

No. of Tests	Test Year	W1348 rus	Russet Norkotah	Russet Burbank	Difference From Russet Norkotah	Difference From Russet Burbank
7	1997	1.077	1.068	1.075	+0.009	+0.002
8	1998	1.084	1.075	1.079	+0.009	+0.005
10	1999	1.079	1.072	1.076	+0.007	+0.003

5. Fry Color From Cold Storage.

The fry color of W1348 rus was lighter than the color of the standard varieties, including Russet Norkotah, Goldrush and Russet Burbank, when grown in Wisconsin and fried directly from cold storage (5.5°C) or after being reconditioned for 2 weeks at room temperature, as shown in the below Table. The Agron M35 values for the fry color of W1348 rus were 64 (10°C storage), 58 (7.2°C storage) and 51 (3.3°C storage plus reconditioning) versus 59, 52 and 37, respectively for Russet Burbank (See Porter et al., 2000 Maine Potato Variety Trials, in National Potato Germplasm Evaluation and Enhancement Report 2000. USDA, ARS-160, Beltsville, MD. pp 144-166, 2002).*

Treatment	Fry Color	Russet Norkotah %	Russet Norkotah Trials	Goldrush %	Goldrush Trials	Russet Burbank %	Russet Burbank Trials
15.5°C 1 month direct	4.9	87.5	14	87.0	12	95.8	12
5.5°C 3 months direct	8.0	82.9	14	92.0	12	89.5	12
5.5°C 3 months reconditioned	7.5	88.9	13	88.9	12	87.6	12
5.5°C 6 months direct	9.1	89.6	8	91.1	7	92.5	6
5.5°C 6 months reconditioned	7.0	73.4	8	76.4	7	83.4	6

Fry color of W1348 rus was compared with the mean of the fry color of the standard varieties and expressed in percentage, when a visual PCII scoring scale was used (1-10,

where 1 is light and 10 is dark), based on data from 6 to 14 comparative trials conducted in Wisconsin for 5 years (years 1996 – 2000). The lower the percentage values, the better fry color of W1348 than the standard varieties.

* All these references are included in the enclosed publication H. I. Groza, B. D. Bowen, D. Kichefski, S. J. Peloquin, W.R. Stevenson, A.J. Bussan and J. Jiang, 2005: Millennium Russet: A Dual Purpose Russet Potato Variety. *Amer. J. of Potato Res.* 82: 211-219. This publication is regarding W1348 rus (referred to as "Millennium Russet") and describes this variety by comparing it with Russet Burbank and Russet Norkotah.

Also enclosed is an enlarged copy of Figure 2 from this paper, which contains 6 photographs (labeled A-F). This photograph shows the morphological characteristics of W1348 rus. Specifically, Fig. 2A shows the plant, Fig. 2B a leaf, Fig. 2C a flower, Fig. 2D a sprout and Fig. 2E and 2F a tuber.

We are also enclosing a copy of a photograph of a tuber of Russet Burbank for your review. This photograph was obtained from the following website.
www.umaine.edu/paa/var.htm.

Supplemental Exhibit D
Variety: 'Millennium Russet'

'Millennium Russet' provides some distinct quality advantages over 'Russet Burbank'. These include better frying quality from all tested (See, Supplemental Exhibit B) and a higher specific gravity, especially when the environment is conducive too the accumulation of high solids. Evidence for differences in solids is provided below in Table C

Experimental Procedure:

The field experimental design in each case included plot sizes of 6.1m containing single rows of plants separated 0.30m within and 0.91m among rows in a randomized complete block design with four replications. Specific gravity was estimated after harvest weighting approximately 4000g (10 lbs) random samples of tubers within each plot in the air and then weighting the same sample in the water, and following the expression:

Specific gravity = Weight in air/(Weight in air - Weight in water).

Analyses of variance for the cultivars were calculated by SAS proc mixed and the LSD around the mean were obtained from the confidence intervals around the best linear unbiased predictors of the mean performance of the cultivars. Please note that at three locations out eight the 'Millennium Russet' gave higher specific gravity as compared to 'Russet Burbank'.

Table C: Analyses of specific gravity of 'Millennium Russet' vs. 'Russet Burbank' over 8 locations and three years (1997-1999), data cooperated through the North Central Regional Trials.

Location	'Millennium Russet'	'Russet Burbank'	Difference	LSD (0.05)
Alberta	1.101	1.091	0.010	0.007*
Manitoba	1.093	1.086	0.007	0.007*
OH	1.075	1.064	0.011	0.009*
IA	1.062	1.056	0.006	0.008
NE	1.075	1.071	0.004	0.007
MI	1.072	1.070	0.002	0.006
MN	1.075	1.078	-0.003	0.006
Ontario	1.070	1.075	-0.005	0.009

Note: Specific gravity differences are of great importance to the processing industry. In every case where the growing conditions were favorable to the expression of high specific gravity (>1.085), a statistically significant higher specific gravity was observed in 'Millennium Russet'.

Millennium Russet: A Dual Purpose Russet Potato Variety

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ABSTRACT

Millennium Russet is a medium-late variety with long tubers having light russet skin and white flesh. It has potential as a fresh market and processing (french fries) variety. The tuber type of Millennium Russet is similar to Russet Burbank, but with better external and internal quality. The marketable yield, tuber set, and specific gravity are higher than Russet Burbank. Tubers show good fry color when processed from cold storage (7.2 C). Millennium Russet has a bland flavor and is less mealy and discolored than Russet Burbank. Chemical maturity of Millennium Russet occurs at approximately the same time as Russet Burbank, but it has lower sucrose levels in the bud and stem end. The glucose levels of Millennium Russet were 50% less than Russet Burbank throughout the first 4 months of storage at 10 C. Low glucose levels in the stem end of Millennium Russet when processed out of storage suggest tolerance to stress and low vulnerability to sugar end. Millennium Russet is resistant to common scab and corky ring spot, moderately resistant to dry rot, pink rot, and black scurf, and moderately susceptible to Verticillium wilt, bacterial wilt and brown rot. Millennium Russet is more sensitive to blackspot bruise than Russet Burbank, but more resistant to shatter bruise. Tuber yield of Millennium Russet was less responsive to nitrogen rates when compared with Russet Burbank, but tuber size distribution was more responsive to increases in in-row spacing.

RESUMEN

Millennium Russet es una variedad medianamente tardía con tubérculos largos de piel cascuda y color marrón ligero y de pulpa blanca. Es una variedad con potencial para su comercialización en fresco y procesada (papa frita). El tipo de tubérculo es similar al de Russet Burbank, pero con calidad externa e interna superior. El rendimiento comerciable, formación de tubérculos y gravedad específica son más altos que en Russet Burbank. Los tubérculos muestran buen color de fritura cuando se procesan después de almacenamiento en frío (7.2 C). Millennium Russet tiene un sabor suave y es menos harinoso y descolorido que Russet Burbank. La madurez química de Millennium Russet se produce casi al mismo tiempo que Russet Burbank, pero tiene niveles de sacarosa más bajos en los brotes y extremo del tallo. Los niveles de glucosa de Millennium Russet fueron 50% más bajos que los de Russet Burbank en los primeros cuatro meses de almacenamiento a 10 C. Los bajos niveles de glucosa en el extremo del tallo cuando se procesaron los tubérculos sacados de almacenamiento, sugiere tolerancia al estrés y baja vulnerabilidad del azúcar. Millennium Russet es resistente a la sarna común y al anillo corchoso, moderadamente resistente a la pudrición seca, pudrición rosada y costra negra, moderadamente susceptible a la marchitez por Verticillium, marchitez bacteriana y pudrición morena. Millennium Russet es más sensible a la mancha negra por efecto de magulladura que Russet Burbank, pero más resistente a destrozarse cuando ha sufrido golpes. El rendimiento de tubérculos de Millennium Russet tuvo menor respuesta a las dosis de nitrógeno comparado con Russet Burbank, pero la distribución del tamaño del tubérculo respondió mejor al aumento de distanciamiento del surco.

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ADDITIONAL KEY WORDS: *Solanum tuberosum*, russet variety, fresh market, french fry

INTRODUCTION

Millennium Russet (W1348rus) was derived from a cross between Atlantic and FL1154rus (Figure 1). It can be utilized for fresh market or for french fry processing. Hybridization and selection were completed at the Rhinelander Agricultural Research Station of the University of Wisconsin-Madison. Atlantic (maternal) is well known for its high specific gravity and good chipping color, while FL1154rus (paternal) has moderate resistance to *Vorticillium* wilt. The cross was made in 1988. Millennium Russet was in seedling stage in 1989, single-hill plots in 1990, 4-hill plots in 1991, 8-hill plots in 1992, 20-hill plots in 1993, 40-hill plots in 1994, and observation trials at Hancock and Rhinelander in 1995. Millennium Russet was included in replicated trials at Hancock and Rhinelander from 1996 to 1998 and in the North Central Regional Trial from 1997 to 1999. Millennium Russet was introduced into the Wisconsin Seed Certification Program as W1348rus in 1998 (18.6 ha of seed was certified in year 2000).

VARIETAL DESCRIPTION

Plants

Haulm: Erect growth habit, intermediate stem type, 120-day maturity (mid-season variety similar to Russet Burbank), medium size, slow emergence, uniform canopy with fine vines (Figure 2). Full canopy closure occurs 2 to 3 wk later than Russet Burbank. **Stems:** medium high number (three to five per plant), branched; no anthocyanin coloration, weak stem

wings. **Leaves:** dark green (2.5 G 5/4 Munsell Color Chart) with medium short pubescence; medium open silhouette, medium leaf stipule size. **Terminal leaflets:** narrowly ovate shape, acuminate tip and truncate base shape, slight margin waviness. **Primary leaflets:** narrowly ovate, small to medium sizes, four pairs. **Secondary and tertiary leaflets:** four pairs. **Petiole:** no anthocyanin coloration.

Inflorescence

Flowers: one to three inflorescences per plant, two to four flowers per inflorescence, medium peduncle length. **Calyx:** no anthocyanin pigmentation. **Corolla:** purple (5 RP 8/4 Munsell) with white tips, pentagonal shape. **Stigma:** capitate, pale green (2.5 GY 8/8 Munsell). **Anthers:** pear shape cone, fairly abundant pollen. **Berries:** few.

Tubers

Tuber shape and size: long, medium size, average eight to 20 tubers per plant; mean tuber length 98.9 mm (range 58 to 138, 20.5 standard deviation), mean tuber width 48.5 mm (range 37 to 64, 5.7 standard deviation), mean tuber thickness 41.1 mm (range 32 to 57, 5.2 standard deviation). **Indices:** length to width 2.04, length to thickness 2.41, width to thickness 1.01. **Skin:** light russet (5 YR 5/4 Munsell). **Flesh:** white (5 YR 8/4 Munsell). **Eyes:** shallow, mean number of eyes per tuber 12 (range eight to 14), evenly distributed. **Sprouts under diffuse light:** a conical general shape, absent pubescence on the sprout base, green sprout base with weak intensity of anthocyanin coloration; closed sprout tip, weakly pubescent of red-

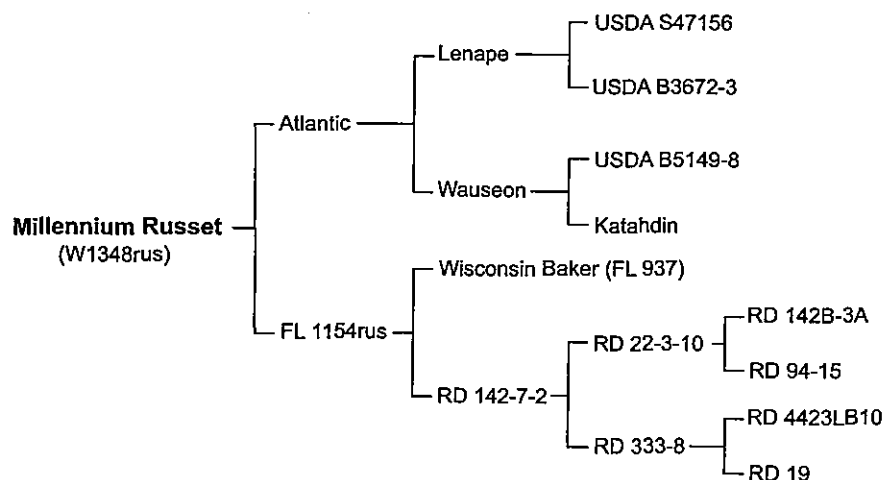


FIGURE 1.
Pedigree of Millennium Russet.

violet color; medium frequency of sprout root initials, medium protrusion of lenticels, short lateral shoots. In full light, the sprout base shows a more intense red-violet color (5/6 RP in Munsell Color Chart). *Physiologic characteristics*: medium late tuber chemical maturity, medium to long dormancy.

The tubers of Millennium Russet have medium size (170-283 g) with light russet skin. The general appearance of the tubers is similar to Russet Burbank, but the shape is much smoother and more uniform and free of external defects that are characteristic to Russet Burbank (growth cracks or second growth). The tuber length : width ratio for Millennium Russet is higher than for Russet Burbank, with 68% tubers having a ratio of 1.97 or greater compared to only 16% for Russet Burbank. The average number of tubers per stem in Millennium

Russet is slightly higher than in Russet Burbank (3.1 vs 2.7). The dormancy period of Millennium Russet is shorter than that of Russet Burbank (104 days vs 167 days at 7.2 C).

Agronomic Performance

The total yield and the US No. 1 yield for Millennium Russet were consistently higher than Russet Norkotah in the North Central Regional Trial (Tables 1 and 2) with highest yields obtained in Minnesota and Wisconsin. In a 3-year trial in Othello, Washington, Millennium Russet had 129% of the US No. 1 yield of Russet Burbank, with a higher total number of tubers per plant (117%) and a similar mean tuber size (99%) (Thornton and Knowles 1999, 2000, 2001).

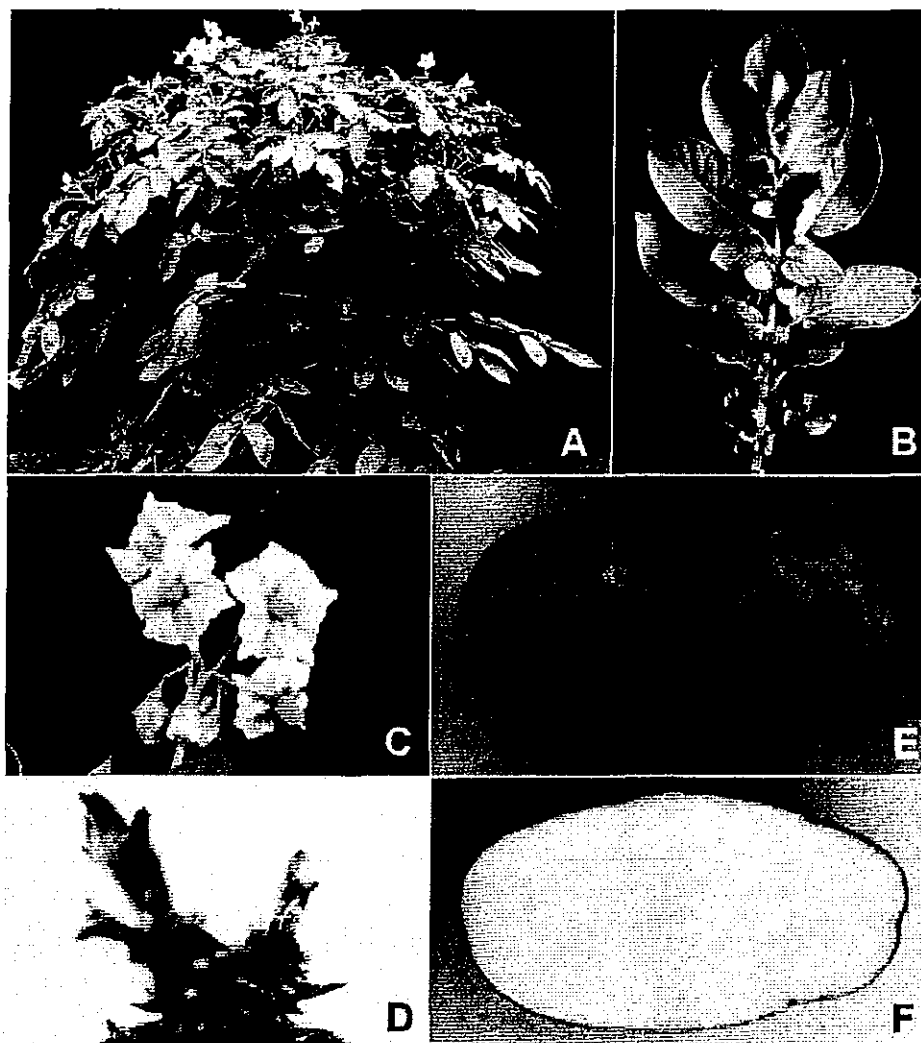


FIGURE 2.
Morphological characteristics of Millennium Russet variety. (A) plant; (B) leaf; (C) flower; (D) sprout; (E) and (F) tuber.

The tuber size distribution for Millennium Russet in Hancock, Wisconsin, was similar to Russet Burbank (Kostichka 1997, 1998, 1999, 2000). However, in Othello, Washington, Millennium Russet tubers were smaller than those of Russet Bur-

bank with 37.8% tubers in the 6- to 10-oz category (170.1-283.5 g) and only 43.8% in the >10-oz category (>283.5 g), compared to Russet Burbank with 21.1% in the 6- to 10-oz category (170.1-

283.5 g) and 61.0% in the >10-oz category (>283.5 g) (Thornton and Knowles 2000, 2001). Alternative production practices may be needed for Millennium Russet in order to produce more tubers >283 g, which are preferred by the processing industry (Groza et al. 2001).

When grown on sandy soils (Hancock, Wisconsin), bulking rates of Russet Burbank and Millennium Russet were nearly identical near the end of August. However, Russet Burbank tended to bulk faster than Millennium Russet through June and July of 2003 (Figure 3). Differences in bulking rate may be related to delayed canopy closure as Millennium Russet did not reach 80% canopy closure until 7 to 10 days after Russet Burbank (Bussan and Drilias 2004). In addition to bulking later, Millennium Russet had more stems and set more tubers than Russet Burbank (Table 3). The total

number of tubers greater than 1 cm in diameter by the end of July was identical between the two varieties, but Millennium Russet had set 30% more total tubers than Russet Burbank.

The percentage of Millennium Russet tubers free of internal defects was 89% in 1997 and 94% in 1998 in the North Central Regional Trials (vs 79% and 94%, respectively, for Russet Burbank). In the Columbia River Basin, 100% Millennium Russet tubers of >12 oz (340.2 g) (12 oz) were free of internal defects, vs 82.7% in Russet Burbank (Thornton and Knowles 2000, 2001).

Specific gravity was consistently higher in Millennium Russet than in Russet Norkotah and Russet Burbank in the

TABLE 1—Total yield (t/ha) of Millennium Russet in the North Central Regional Trial.*

No. of Tests	Test Year	Millennium Russet (average, range)	Russet Norkotah	Russet Burbank	Difference from	
					Russet Norkotah	Russet Burbank
7	1997	40.0 (22.2-73.7**)	35.9	46.7	+4.1	-6.7
8	1998	42.0 (20.0-61.8**)	36.8	44.0	+5.2	-2.0
10	1999	38.0 (17.7-65.8**)	32.7	51.1	+5.3	-13.1

*The North Central Regional Trial includes data from Alberta, Manitoba, Michigan, Minnesota, Nebraska, Ontario, and Wisconsin (irrigated); Iowa, North Dakota, and Ohio (dry land).

**The highest yields were recorded in Minnesota in all the three years.

TABLE 2—Marketable yield (t/ha) of Millennium Russet in the North Central Regional Trial.*

No. of Tests	Test Year	Millennium Russet	Russet Norkotah	Russet Burbank	Difference from	
					Russet Norkotah	Russet Burbank
7	1997	23.8	19.6	17.6	+4.2	+6.2
8	1998	29.7	34.0	24.9	-4.3	+4.8
10	1999	26.3	21.6	23.5	+4.7	+2.8

*The North Central Regional Trial includes data from Alberta, Manitoba, Michigan, Minnesota, Nebraska, Ontario, and Wisconsin (irrigated); Iowa, North Dakota, and Ohio (dry land).

TABLE 3—Tuber and stem number of Russet Burbank and Millennium Russet.

Cultivar	Tubers/plant*				Stems/plant*
	Total (N)	<1 cm diameter (N)	>1 cm diameter (N)	(%)	
Russet Burbank	18.4	4.0	14.4	79.2	3.0
Millennium Russet	25.7	11.5	14.2	56.1	3.9
LSD ($P = 0.05$)	5.1	3.4	2.3	6.3	0.6

*Average across 30-50 cm in-row spacing.

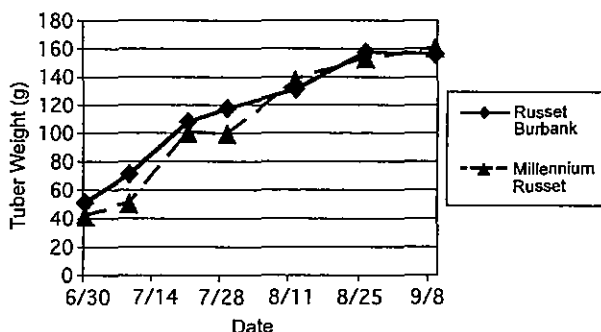


FIGURE 3. Tuber bulking rates of Russet Burbank and Millennium Russet in 2003 (Hancock, Wisconsin).

North Central Regional Trial (Table 4), and averaged 1.091 for Millennium Russet (vs 1.080 in Russet Burbank) over 3 years (1999-2001) in the Columbia Basin (Thornton and Knowles 1999, 2000, 2001). The fry color of Millennium Russet was lighter than the color of the standard varieties, including Russet Norkotah, Goldrush, and Russet Burbank, when grown in Wisconsin and fried directly from the cold storage (5.5 C) or after being reconditioned for 2 wk at room temperature (Table 5). The Agron M35 values for the fry color of Millennium Russet tubers were 64 (10 C storage), 58 (7.2 C storage) and 51 (3.3

C storage plus reconditioning) vs 59, 52, and 37, respectively, for Russet Burbank (Porter et al. 2002).

Chemical maturity of Millennium Russet occurred at approximately the same time as Russet Burbank (Figure 4). The glucose level of Millennium Russet was 50% or less of that in Russet Burbank throughout the first 4 months in storage at 10 C (Figure 5). In addition, the glucose level in the stem end was lower for Millennium Russet than for Russet Burbank, suggesting that Millennium Russet may be less vulnerable to sugar end.

The cooking quality of Millennium Russet was compared

with Russet Burbank and Dark Red Norland (Table 6). The sloughing in Millennium Russet was less than in Russet Burbank, but tubers were not as firm as Dark Red Norland. The boiled tubers of Millennium Russet had a bland flavor and were less mealy and discolored than Russet Burbank, but the overall taste was less flavorful than Russet Burbank.

The tubers of Millennium Russet

TABLE 4—Specific gravity of Millennium Russet in the North Central Regional Trial.*

No. of Tests	Test Year	Millennium Russet	Russet Norkotah	Russet Burbank	Difference from Russet Norkotah	Difference from Russet Burbank
7	1997	1.077	1.068	1.075	+0.009	+0.002
8	1998	1.084	1.075	1.079	+0.009	+0.005
10	1999	1.079	1.072	1.076	+0.007	+0.003

*The North Central Regional Trial includes data from Alberta, Manitoba, Michigan, Minnesota, Nebraska, Ontario and Wisconsin (irrigated); Iowa, North Dakota and Ohio (dry land).

TABLE 5—Fry color of Millennium Russet compared with standard varieties.*

Treatment	Fry Color	Russet Norkotah %	Russet Norkotah Trials	Goldrush %	Goldrush Trials	Russet Burbank %	Russet Burbank Trials
15.5 C 1 month direct	4.9	87.5	14	87.0	12	95.8	12
5.5 C 3 months direct	8.0	82.9	14	92.0	12	89.5	12
5.5 C 3 months reconditioned	7.5	88.9	13	88.9	12	87.6	12
5.5 C 6 months direct	9.1	89.6	8	91.1	7	92.5	6
5.5 C 6 months reconditioned	7.0	73.4	8	76.4	7	83.4	6

*Fry color of Millennium Russet compared with the mean of fry color of standard varieties and expressed in percentage, when a visual PCI scoring scale was used (1-10, where 1 is light and 10 is dark), based on data from six to 14 comparative trials conducted in Wisconsin (1996-2000). The lower percentage values, the better fry color than the

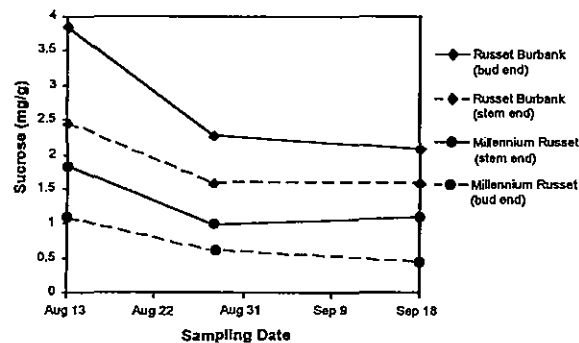


FIGURE 4. Chemical maturity of Russet Burbank and Millennium Russet during 2002 growing season (Hancock, Wisconsin).

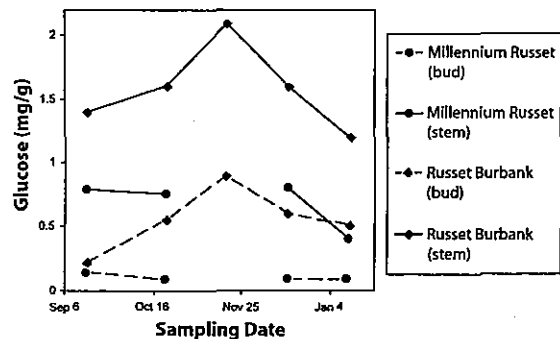


FIGURE 5. Glucose content of Russet Burbank and Millennium Russet potato tubers stored in a commercial cellar at 5 C.

TABLE 6—Cooking evaluation of Millennium Russet and standard varieties.*

Cultivar	Sloughing (1-10)	Mealiness (1-10)	Discoloration		Texture (1-5)	Flavor (1-5)	Overall (1-5)
			Raw (1-10)	Cooked (1-10)			
Millennium Russet	7.0	7.0	5.5	4.2	4.0	3.0	2.5
Russet Burbank	6.2	6.0	4.0	7.0	5.0	2.0	3.0
Dark Red Norland	8.0	8.0	5.0	8.0	2.0	4.0	4.0

*Higher values are desirable for the traits evaluated (1 = very poor).

Texture scores: 2 = pasty, 4 = fluffy, 5 = mealy. Flavor scores: 2 = muddy, 3 = bland, 4 = sweet

TABLE 7—Disease responses of Millennium Russet and Russet Burbank.*

Cultivar	Verticillium Wilt	Common Scab	Early Blight		Late Blight		Pink Rot	Soft Rot	Dry Rot	Brown Rot	Black Scurf	Corky Ringspot
			Foliage	Tuber	Foliage	Tuber						
Millennium Russet	MS	R	MS	MS	MS	S	MR	S	MS	MS	R	R
Russet Burbank	S	MR	MS	MS	S	S	MS	S	S	MS	MS	S

*Ratings are defined as very resistant (VR), resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S) and very susceptible (VS). The diseases in the table are in order: Verticillium wilt (*Verticillium dahliae*), common scab (*Streptomyces scabies*), early blight (*Alternaria solani*), late blight (*Phytophthora infestans*), pink rot (*Phytophthora erythroseptica*), soft rot (*Erwinia carotovora*), dry rot (*Fusarium sambucinum*), brown rot (*Ralstonia solanacearum*), black scurf (*Rhizoctonia solani*), corky ringspot (*Tobacco rattle virus*).

are more sensitive to blackspot bruise than Russet Burbank and Russet Norkotah (2.5 vs 4.5 and 5.0, respectively, on a scale of 1-5 with 5 indicating no symptoms), but comparable for shatter bruising (Thornton and Knowles 2001). Similar results for blackspot bruise were reported by Douches et al. (1998). Shatter bruise damage was minimal and similar to Russet Burbank (1.06 vs 1.33 in scale 1-9), but skinning was higher (3.39 vs 1.96) in tests conducted immediately after harvest (Porter et al. 2002).

DISEASE EVALUATIONS

Millennium Russet is more resistant to common scab (*Streptomyces scabies*) than Russet Burbank (Table 7). From 1997 to 1999, Millennium Russet showed 0% tuber infection in Iowa, Nebraska, North Dakota, Ohio and Manitoba, 0% to 1% infection in Minnesota and Wisconsin and more than 1% in Michigan in the North Central Regional Trials (Novy and Farnsworth 1998; Novy et al. 1999; Thill 1999). In a Wisconsin common scab test plot, the mean lesion area index was 4.46 and the mean lesion type index was 6.16 for Millennium Russet tubers compared with 8.46 and 15.63, respectively, for Russet Burbank (Stevenson et al. 2000, 2001, 2002). No symptoms of common scab were found in other scab test plots (Douches et al. 1999, 2001; Jiang et al. 2003).

Millennium Russet had similar susceptibility to early blight (*Alternaria solani*) in the foliage as Russet Burbank in

trials conducted in Hancock and Rhinelander, Wisconsin (Table 7). The area under the disease progress curves (AUDPC) was 0.068 (0.023 to 0.114) for Millennium Russet and 0.069 (0.014 to 0.133) for Russet Burbank in 2000 to 2002 (Stevenson et al. 2001, 2002). The incidence of early blight on tubers after artificial wound inoculation was 80% for Millennium Russet with 0.59 cm² mean lesion area vs 78.3% and 1.28 cm² for Russet Burbank (Stevenson et al. 2002).

Millennium Russet vines are susceptible to late blight (*Phytophthora infestans*) (Table 7), but less susceptible than Russet Norkotah and Goldrush (Stevenson et al. 2002). The tubers are susceptible to *P. infestans* races of US-8 genotype. According to Stevenson et al. (2002), the incidence of late blight on artificially wounded and inoculated tubers of Millennium Russet was 100% (44 cm² affected area), which is identical to Russet Burbank (100% and 37.1 cm², respectively).

Millennium Russet tubers are less susceptible to pink rot (*Phytophthora erythroseptica*) than Russet Burbank with 24.4% incidence and 17.5 cm² infected area vs 66.7% with 57.3 cm², respectively (Stevenson et al. 2002). Millennium Russet and Russet Burbank tubers had similar susceptibility to bacterial soft rot (*Erwinia carotovora*) (10.4 mm rotted area vs 12.8 mm) (Robert Rand unpubl data) (Table 7).

Millennium Russet is moderately susceptible to early dying caused by Verticillium wilt and *Pratylenchus penetrans* (root lesion nematode) (Table 7). The percentage of early

dying in the first week of August in 1999 at Hancock (Wisconsin) was 28% (range 10% to 45%) for Millennium Russet compared to Reddale, which showed a mean percentage of 40% (Douglas Rouse unpubl data). However, in the last week of August in 1999, the percentage of early dying increased to 94% for Millennium Russet and 95% for Reddale (Shelley Jansky unpubl data). No black scurf sclerotia (*Rhizoctonia solani*) were reported by Groza et al. (2003) on Millennium Russet tubers in the replicated trials conducted in Hancock, Wisconsin, from 1996 to 1998 (vs 5% for Russet Burbank).

Millennium Russet was moderately susceptible to bacterial wilt and brown rot (*Ralstonia solanacearum*) under natural infection conditions in Hastings, Florida (Peter Weingartner unpubl data). Millennium Russet was resistant to corky ringspot (Tobacco rattle virus) externally (0.7% and 0.5 severity) and internally (0.7% and 0.5 severity), under Florida conditions (Peter Weingartner unpubl data). In the same trial data, Red LaSoda scored 9.9% and 18.7 severity externally, and 10.5% and 24.7 severity internally.

Douches et al. (1998) reported a moderate infection to potato dry rot (*Fusarium sambucinum*) based on inoculation studies: 7.4 mm width with 12.1 mm depth of lesion in Millennium Russet vs 10.8 with 9.1, respectively, in Russet Burbank. Millennium Russet shows bacterial ring rot (*Clavibacter michiganensis* ssp. *sepedonicum*) symptoms in vines and also in tubers (20% vascular discoloration, 20% rot with cheesy exudates and 20% external periderm cracking), according to Lisa Piche, Julie Pasche and Neil Gudmestad (unpublished data).

AGRONOMIC PRODUCTION

Under Wisconsin Central Sands conditions, a wider in-row spacing of plants (>30.4 cm) and a rate of 246.6 kg/ha of nitrogen increased the proportion of Millennium Russet tubers >283.5 g (Connell et al. 2000). Total yield of Millennium Russet remained constant or tended to decrease as the in-row spacing was increased from 30 to 50 cm (Table 8). However, the yield of tubers <47.6 mm in diameter and culls declined with increased in-row spacing, resulting in an increase in US No. 1 yield at lower plant densities. Wider in-row spacing also resulted in a shift in the size distribution of potato within the US No. 1 class. Yield of tubers <170 g declined and yields of tubers >170 g increased as in-row spacing was increased from 30 to 50 cm. Russet Burbank and Millennium Russet had similar total yields in cultural practice trials conducted in Hancock, Wisconsin (data not shown). Millennium Russet tended to have a smaller overall tuber size distribution than Russet Burbank, but had a larger response to increases in in-row spacing than Russet Burbank. The biggest differences in size distribution between Russet Burbank and Millennium Russet were seen in tubers <47.6 mm in diameter and >280-g size categories.

Millennium Russet was less responsive to increasing nitrogen rates than Russet Burbank, requiring 10% to 20% less nitrogen for maximum yields. On sandy soils, highest yields were consistently obtained when starter fertilizer (9 to 13.6 kg/ha N) was supplemented with 25% to 35% of the nitrogen applied at emergence, 50% to 60% of the nitrogen applied at

TABLE 8—Response of Millennium Russet yield and tuber size distribution to increasing in-row spacing.*

Spacing (cm)	Year	Total	Yield (ton/ha)								
			US No. 1	<46.6 (mm)	Culls	<113 g	113-170 g	170-280 g	280-370 g	370-454 g	>454 g
30	1998	35.1	27.1	4.5	3.7	10.0	11.3	5.5	0.2	0.0	0.0
	1999	65.4	50.9	2.5	11.8	8.1	13.7	17.7	5.9	3.4	2.3
	2002	45.2	32.0	9.8	7.9	7.8	13.5	10.2	0.5	0.0	0.0
	2003	44.8	35.1	3.0	6.7	6.3	10.9	13.7	2.5	1.4	0.4
	Average	48	36	5	8	8	12	12	2	1	1
37.5-40	1998	29.2	30.5	4.0	3.6	12.4	11.8	6.0	0.2	0.3	0.0
	1999	61.7	49.0	2.3	10.4	6.8	13.0	17.7	6.1	3.1	2.2
	2002	47.5	34.9	9.6	2.9	6.7	15.1	12.0	1.2	0.0	0.0
	2003	41.1	35.4	2.7	3.1	5.3	10.3	15.2	2.8	1.1	0.4
	Average	45	37	5	5	8	12	13	3	1	1
45-50	1998	-	-	-	-	-	-	-	-	-	-
	1999	61.1	48.5	1.7	10.9	6.7	10.6	16.8	7.5	4.0	2.9
	2002	40.0	27.7	9.1	3.3	3.9	11.9	10.8	1.0	0.0	0.0
	2003	44.0	39.0	2.0	3.0	4.7	10.1	16.4	5.5	1.6	0.8
	Average	48	38	4	6	5	11	14	5	2	1

*Trials were planted in rows 75 cm as compared to 90 cm apart.

mid-tuberization, and the remaining 5% to 35% applied 2 to 3 wk later. On medium-textured soils, nitrogen could be applied in one or two applications. The petiole $\text{NO}_3\text{-N}$ data showed that at the economic optimum N rate (EONR), Millennium Russet generally contains about the same $\text{NO}_3\text{-N}$ level in the fourth petiole as Russet Burbank, but more than Atlantic when sampled 55 days after emergence (DAE). However, by 70 DAE, petiole nitrate levels at the EONR are higher in both Russet Burbank and Atlantic than in Millennium Russet (Kelling and Speth 2004).

Millennium Russet is not sensitive to metribuzin. Metribuzin applied postemergence at 560.4 g/ha and 1120.8 g ai/ha caused no injury 55 days after planting, but 5% injury was recorded 70 days after planting (Larry Binning and Daniel Heider unpubl data).

CHEMISTRY

The glycoalkaloid content of Millennium Russet was acceptable at 10.44 mg/100 g fresh tissue (4.57 mg/100 g solanine and 5.87 mg/100 g chaconine), in comparison with 8.00 mg/100 g for Russet Burbank, 8.00 mg/100 g for Goldrush, and 5.46 mg/100 g for Russet Norkotah (Kenneth Deahl and Frances Perez unpubl data).

The isozyme pattern of Millennium Russet is *Mdh-1* 1¹1²1², *Mdh-2* 2²2²2², *Got-1* 1³1³1⁴, *Got-2* 2³2³2⁵, *Pgm-1* 1¹1³1³, *Pgm-2* 2²2²2², *Pgi-1* 1²1²1², *6-Pgdh-3* 3³3³3³, *Prx-3* 3³3³3⁴, where the normal script digit represents the locus and the superscript digit represents the allele for the enzymes malate dehydrogenase (*Mdh*), glutamate oxaloacetate transaminase (*Got*), phosphoglucosmutase (*Pgm*), phosphoglucose isomerase (*Pgi*), 6-phosphoglucosonic acid dehydrogenase (*6-Pgdh*), and peroxidase (*Prx*), according to the procedure and nomenclature of Douches and Ludlam (1991).

SEED AVAILABILITY

Millennium Russet was initiated as tissue culture plantlets in 1998 by Summit Plant Laboratories in Colorado and in 2001 by the Department of Plant Pathology, University of Wisconsin, within the Wisconsin Seed Potato Certification Program. Foundation seed is available from Dennis Bula at Bula Potato Farms, W 11957 Highland Rd, Antigo, WI 54409. Forms have been submitted for Plant Variety Protection.

ACKNOWLEDGMENTS

We thank Dr. David Douches, Michigan State University, for establishing the isozyme identity of Millennium Russet. We also thank Dr. Douglas Rouse and other plant pathology colleagues who tested the early dying susceptibility of Millennium Russet and Dr. Keith Kelling for evaluating the response of Millennium Russet to varying levels of nitrogen fertility. The Wisconsin potato breeding program is financially supported by USDA/CSREES, the Wisconsin Potato and Vegetable Growers Association, and Hatch funds.

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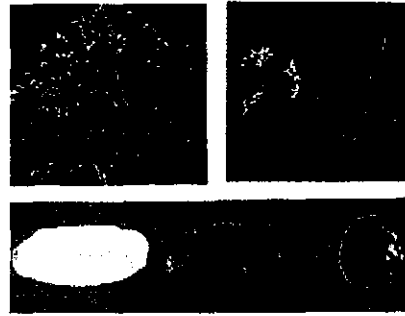
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#200100041

Russet Burbank

SYNONYMS: Idaho Russet, Netted Gem

ORIGIN: The origin of Russet Burbank was reported by Luther Burbank in 1914 as being a chimera selected from the variety Burbank by Lou Sweet. Lou Sweet was a potato grower in the western slope area of Colorado and was President of the Potato Association of America in 1920.



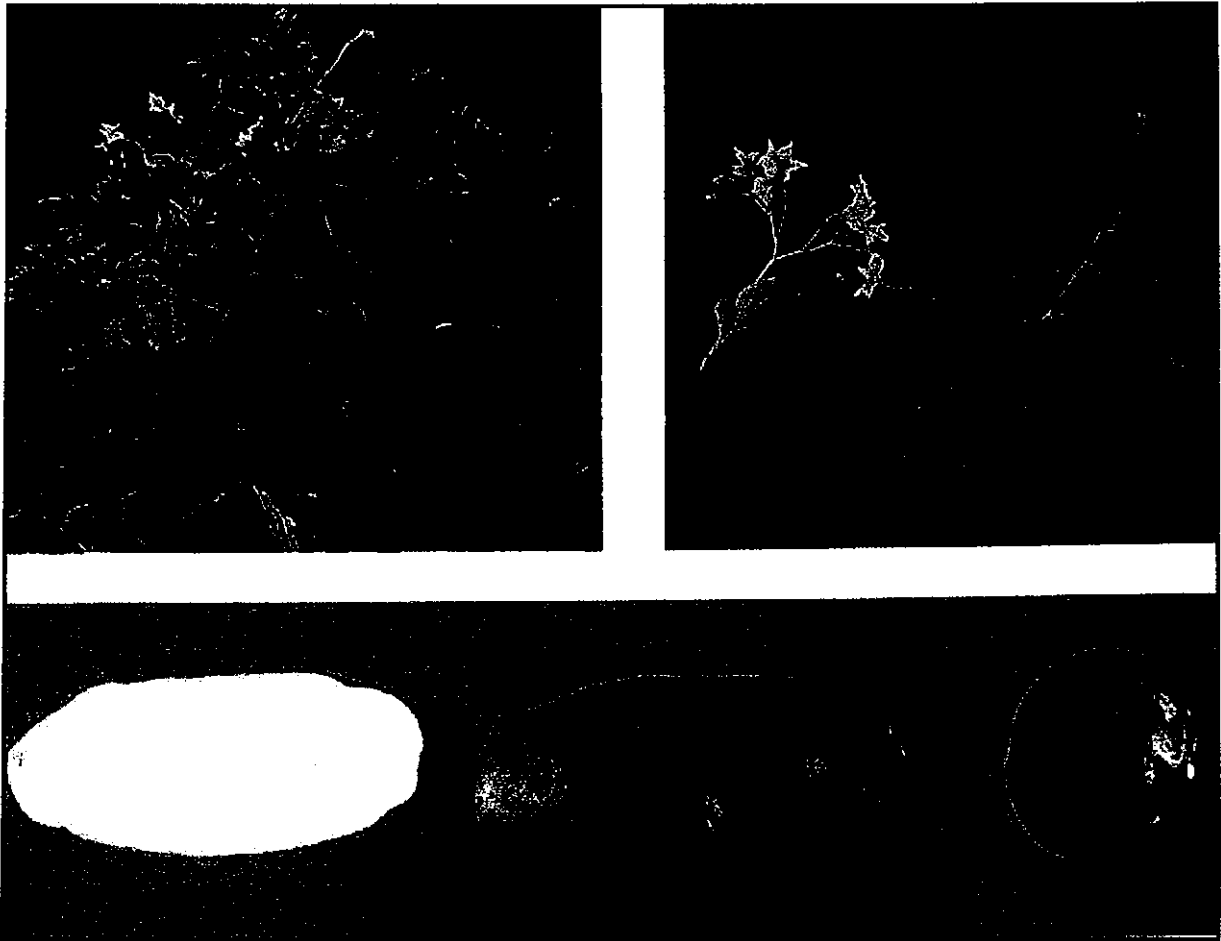
CHARACTERISTICS: A late maturing variety that requires a 140 to 150 day growing season to produce maximum yields and quality. Yields are moderately high ranging from 250 to 600 cwt/A (28 to 67 t/ha). The cultivar is well adapted and primarily grown with irrigation in the northwestern states of Idaho, Washington, Oregon, Montana, and in Canada. It is also grown in several north-central and mid-western states.

Plants are vigorous, spreading and have an indeterminate type of growth. Stems are thick, prominently angled and finely mottled. Leaflets are long, medium in width and light to medium green in color. The blossoms are few, white and not fertile. Tubers are large, long and cylindrical or slightly flattened with russeted skin. The eyes are shallow and the flesh is white.

STRENGTHS & WEAKNESSES: The variety is the standard for excellent baking and processing quality. The cultivar is tolerant to common scab but is susceptible to Fusarium and Verticillium wilts, leafroll and net necrosis and virus Y. Jelly-end and sugar-end develop in tubers when plants are subjected to stress. Plants require conditions of high and uniform soil moisture and controlled nitrogen fertility to produce tubers free from knobs, pointed ends and dumbbells. It is a good long-term storage potato for tablestock and processing.

| [PAA Homepage](#) | [Variety List](#) |

#200100041

Solanum tuberosum 'Russet Burbank'

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| [PAA Homepage](#) | [Variety Description](#) | [Variety List](#) |

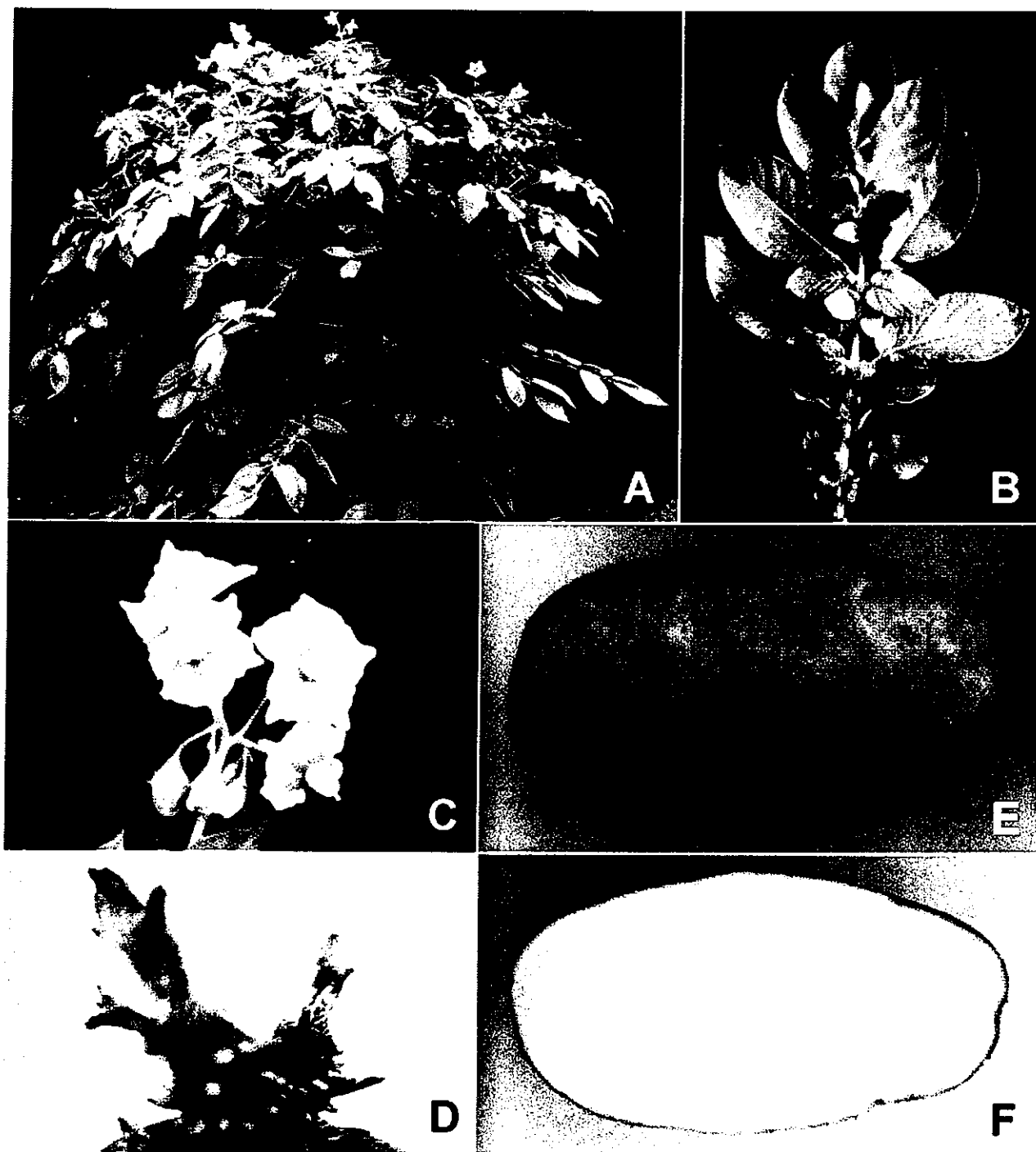
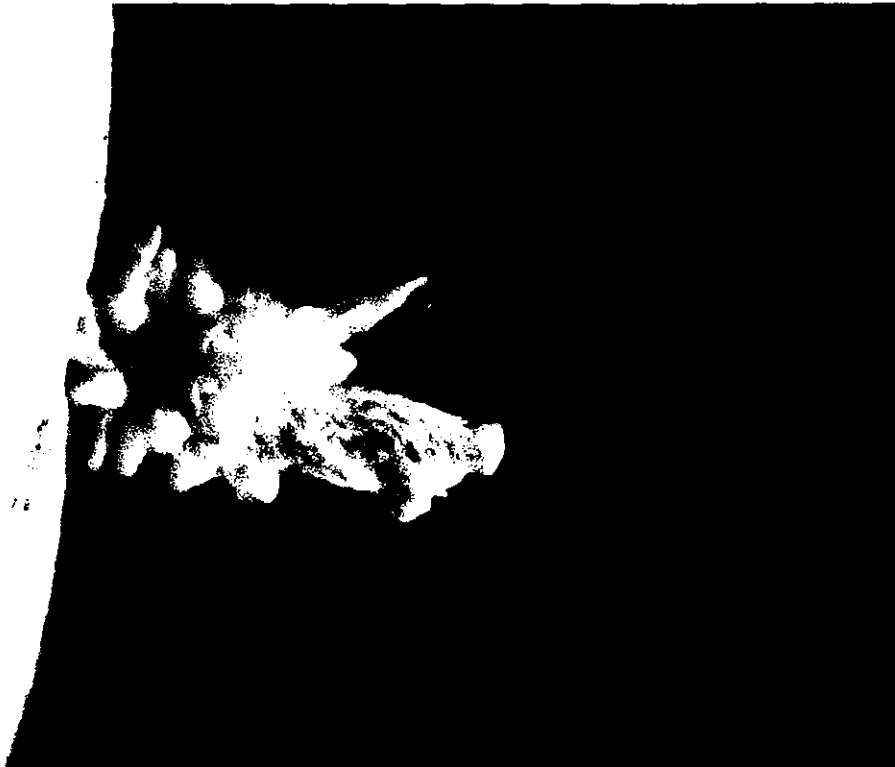


Fig. 2



tuber light sprout



tuber marketable size

EXHIBIT B

Isozyme electrophoresis fingerprints of W 1348 rus compared with Russet Burbank

Variety	Mdh-1	Mdh-2	Pgdh-3	Pgi-1	Got-1	Got-2	Pgm-1
W 1348	1222	2222	1112	2222	3344	3355 3355 5/12/05 1333	1333
Russet Burbank	1222	2222	1222	2222	3344	5555	1133

Source of Data: Dr. David Douches, Michigan State University

Procedures and allelic designations used are according to Douches, D.S. and K. Ludlam, 1991
Electrophoretic Characterization of North American Potato Cultivars. Amer. Potato J. 68: 767-780.

#200100041

U.S. DEPARTMENT OF AGRICULTURE
 AGRICULTURAL MARKETING SERVICE
 SCIENCE AND TECHNOLOGY DIVISION
 PLANT VARIETY PROTECTION OFFICE

OBJECTIVE DESCRIPTION OF VARIETY
POTATO (*Solanum tuberosum* L.)

INSTRUCTIONS

The Objective Description Form:

The objective description form lists characteristics to be used as the basis for developing the description of potato varieties. It is designed to guide the applicant in describing a variety in detail so a meaningful comparison with other potato varieties can be accomplished. It is recommended that this form be completed in as much detail as possible to ensure an accurate description. Please fill in the requested data and place the appropriate number that describes the varietal characters typical of this potato variety and the reference varieties in the respective boxes.

Test Guidelines:

Any statistical and trial (field test) data that may be necessary to support the variety description should be attached to this form. Please include for trial data the plot size, number of replications, number of plants, plant spacing, trial locations and growing periods. Trials should normally be conducted at one place, in the region that the variety has been adapted for, with a minimum of one growing period in the U.S.A. All comparative data should be determined from varieties entered in the same trials. The size of the plots should be such that plants or plant parts of plants may be removed for measuring and counting without prejudice to the observations which must be made at the end of the growing period. As a minimum, each test should include a total of 60 plants which should be divided between two or more replicates. Separate plots for observation and measuring can only be used if they have been subject to similar environmental conditions. To determine color for a plant or plant parts a recognized standard color chart must be used such as the Royal Horticultural Society (R.H.S.) Color Chart.

Reference Varieties:

The application variety should be compared to a set of reference varieties. The reference varieties should be market class standard varieties currently grown in the United States and the varieties most similar. The following varieties are recommended as market class standards to be used as reference varieties:

Yellow-flesh tablestock.....	Yukon Gold
Round-white tablestock.....	Superior
Chip-processing.....	Atlantic, Snowden, Norchip
Frozen-processing.....	Russet Burbank
Russet tablestock.....	Russet Burbank, Russet Norkotah, Goldrush
Red tablestock.....	Red Pontiac, Red Norland, Red Lasoda

Characteristics:

The plant type and growth habit characteristics are collected at early first bloom. Figure 1 is supplied to help visualize the growth habit. For this descriptor, look at the stems rather than the stems and foliage. Plant maturity is measured at natural vine senescence.

Stem characteristics are also collected at early bloom. Stem anthocyanin coloration is divided into two descriptors: Location and intensity. Figure 12 is supplied to give an example of stem wings.

Leaf characteristics are observed at early first bloom. Fully-developed leaves located on the middle third of the plant should be used. Leaf pubescence refers to general trichomes. Figure 2 is supplied for examples of leaf silhouette. Figure 3 should be used to describe terminal and primary leaflet shape. Figures 4 and 5 are used to describe the terminal and primary leaflet shape of tip and base, respectively. To measure the total number of primary leaflets pairs, collect 10 fully-developed petioles (with leaves attached from each replication and take the average number of secondary and tertiary leaflets. Figure 11 is supplied to define leaf characteristics. Glandular trichomes should be described through descriptor #12 (Additional Comments and Characteristics). Leaf stipules are shown in figure 13 for visual definition.

Inflorescence characteristics should be measured at early first bloom. Figures 6 and 7 are supplied to describe corolla and anther shape, respectively. Corolla, calyx, anther, stigma and pollen should be observed on newly opened flowers. Berry production should be based on field-grown plants rather than greenhouse plants.

Tuber characteristics should be observed following harvest. Figures 9 and 10 are available to describe distribution of secondary color and tuber shape, respectively.

NAME OF APPLICANT(S)

Wisconsin Alumni Research Foundation

200100041

FOR OFFICIAL USE ONLY

PVPO NUMBER

#200100041

ADDRESS (Street and No. or R.F.D. No., City, State, and Zip Code)

P.O. Box 7365
614 North Walnut Street
Madison, WI 53707-7365

VARIETY (V) NAME

'Millennium Russet'

TEMPORARY OR EXPERIMENTAL DESIGNATION

W 1348 rus

REFERENCE VARIETIES: Enter the reference variety name in the appropriate box

Reference Variety 1 (R1)	Reference Variety 2 (R2)	Reference Variety 3 (R3)	Reference Variety 4 (R4)
		RUSSET BURBANK	RUSSET NORKOTAH

1. MARKET CHARACTERISTICS:

MARKET CLASS:

1 = Yellow-flesh tablestock; 2 = Round-white tablestock; 3 = Chip-processing; 4 = Frozen-processing;
5 = Russet tablestock; 6 = Other _____

V	5	R1		R2		R3	5	R4	5
---	---	----	--	----	--	----	---	----	---

2. PLANT CHARACTERISTICS:

GROWTH HABIT: (See figure 1)

3 = Erect (> 45° with ground); 5 = Semi-erect (30-45° with ground); 7 = Spreading.

V	3	R1		R2		R3	3	R4	6
---	---	----	--	----	--	----	---	----	---

TYPE:

1 = Stem (foliage open, stems clearly visible); 2 = Intermediate; 3 = Leaf (Foliage closed, stems hardly visible)

V	2	R1		R2		R3	2	R4	2
---	---	----	--	----	--	----	---	----	---

MATURITY: Days after planting (DAP) at vine senescence

V	120	R1		R2		R3	120	R4	100
---	-----	----	--	----	--	----	-----	----	-----

PLANTING DATE:

V	5.01	R1		R2		R3	5.01	R4	5.01
---	------	----	--	----	--	----	------	----	------

REGION/AREA:

V	RHINELANDER WISCONSIN	R1		R2		R3	RHINELANDER WISCONSIN	R4	RHINELANDER WISCONSIN
---	--------------------------	----	--	----	--	----	--------------------------	----	--------------------------

MATURITY CLASS:

1 = Very Early (<100 DAP); 2 = Early (100-110 DAP); 3 = Mid-season (111-120 DAP); 4 = Late (121-130 DAP);
5 = Very Late (>130 DAP).

V	3
---	---

R1	
----	--

R2	
----	--

R3	3
----	---

R4	2
----	---

3. STEM CHARACTERISTICS: *Measure at early first bloom***STEM ANTHOCYANIN COLORATION:**

1 = Absent; 3 = Weak; 5 = Medium; 7 = Strong; 9 = Very Strong

V	1
---	---

R1	
----	--

R2	
----	--

R3	1
----	---

R4	1
----	---

STEM WINGS: *(See figure 12)*

1 = Absent; 3 = Weak; 5 = Medium; 7 = Strong; 9 = Very Strong

V	3
---	---

R1	
----	--

R2	
----	--

R3	3
----	---

R4	1
----	---

1. LEAF CHARACTERISTICS:**LEAF COLOR:** *Observe fully developed leaves located on middle 1/3 of plant*

1 = Yellowish-green; 2 = Olive-green; 3 = Medium green; 4 = Dark green; 5 = Grey-green; 6 = Other _____

V	4
---	---

R1	
----	--

R2	
----	--

R3	4
----	---

R4	3
----	---

LEAF COLOR: *Observe fully developed leaves located on middle 1/3 of plant and circle the appropriate color chart*

Royal Horticulture Society Color Chart value or Munsell Color Chart value

V	2.5G 6/5
---	-------------

R1	
----	--

R2	
----	--

R3	2.5G 6/5
----	-------------

R4	2.5G 6/6
----	-------------

LEAF PUBESCENCE DENSITY:

1 = Absent; 2 = Sparse; 3 = Medium; 4 = Thick; 5 = Heavy

V	3
---	---

R1	
----	--

R2	
----	--

R3	3
----	---

R4	3
----	---

LEAF PUBESCENCE LENGTH:

1 = None; 2 = Short; 3 = Medium; 4 = Long; 5 = Very long

V	3
---	---

R1	
----	--

R2	
----	--

R3	2
----	---

R4	2
----	---

(Note: Descriptor #19 can be used to describe the type and length of the glandular trichomes observed.)

LEAF SILHOUETTE: *(See figure 2)*

1 = Closed; 3 = Medium; 5 = Open

V	4
---	---

R1	
----	--

R2	
----	--

R3	4
----	---

R4	3
----	---

Per letter Sept 28, 2006

PETIOLES ANTHOCYANIN COLORATION:

1 = Absent; 3 = Weak; 5 = Medium; 7 = Strong; 9 = Very Strong

V	1	R1		R2		R3	1	R4	1
---	---	----	--	----	--	----	---	----	---

LEAF STIPULES SIZE: (See figure 13)

1 = Absent; 3 = Small; 5 = Medium; 7 = Large

V	4 3	R1		R2		R3	4	R4	3
---	----------------	----	--	----	--	----	---	----	---

Per letter Sept. 28, 2006
LMC

TERMINAL LEAFLET SHAPE: (See figure 3 & 11)

1 = Narrowly ovate; 2 = Medium ovate; 3 = Broadly ovate; 4 = Lanceolate; 5 = Elliptical;
6 = Obovate; 7 = Oblong; 8 = Other

V	1	R1		R2		R3	2	R4	2
---	---	----	--	----	--	----	---	----	---

TERMINAL LEAFLET TIP SHAPE: (See figure 4 & 11)

1 = Acute; 2 = Cuspidate; 3 = Acuminate; 4 = Obtuse; 5 = Other

V	3	R1		R2		R3	2	R4	2
---	---	----	--	----	--	----	---	----	---

TERMINAL LEAFLET BASE SHAPE: (See figure 5 & 11)

1 = Cuneate; 2 = Acute; 3 = Obtuse; 4 = Cordate; 5 = Truncate; 6 = Lobed; 7 = Other

V	5	R1		R2		R3	5	R4	4.5
---	---	----	--	----	--	----	---	----	-----

TERMINAL LEAFLET MARGIN WAVINESS:

1 = Absent; 2 = Slight; 3 = Weak; 4 = Medium; 5 = Strong

V	2	R1		R2		R3	1	R4	2
---	---	----	--	----	--	----	---	----	---

NUMBER OF PRIMARY LEAFLET PAIRS: (See figure 11)

AVERAGE:

V	4	R1		R2		R3	3	R4	4
---	---	----	--	----	--	----	---	----	---

RANGE:

V	3 to 4	R1	to	R2	to	R3	3 to 3	R4	4 to 5
---	--------	----	----	----	----	----	--------	----	--------

PRIMARY LEAFLET TIP SHAPE: (See figure 4 & 11)

1 = Acute; 2 = Cuspidate; 3 = Acuminate; 4 = Obtuse; 5 = Other

V	2	R1		R2		R3	2	R4	2
---	---	----	--	----	--	----	---	----	---

PRIMARY LEAFLET SHAPE: (See figure 3 & 11)

1 = Narrowly ovate; 2 = Medium ovate; 3 = Broadly ovate; 4 = Lanceolate; 5 = Elliptical;
6 = Obovate; 7 = Oblong; 8 = Other_____

V	1	R1		R2		R3	2	R4	2
---	---	----	--	----	--	----	---	----	---

PRIMARY LEAFLET BASE SHAPE: (See figure 5 & 11)

1 = Cuneate; 2 = Acute; 3 = Obtuse; 4 = Cordate; 5 = Truncate; 6 = Lobed; 7 = Other_____

V	5	R1		R2		R3	5	R4	5
---	---	----	--	----	--	----	---	----	---

NUMBER OF SECONDARY AND TERTIARY LEAFLET PAIRS: (See figure 11)**AVERAGE:**

V	4	R1		R2		R3	3	R4	4
---	---	----	--	----	--	----	---	----	---

RANGE:

V	4 to 4	R1	to	R2	to	R3	2 to 3	R4	3 to 4
---	--------	----	----	----	----	----	--------	----	--------

5. INFLORESCENCE CHARACTERISTICS:**NUMBER OF INFLORESCENCE / PLANT:****AVERAGE:**

V	2	R1		R2		R3	2	R4	1
---	---	----	--	----	--	----	---	----	---

RANGE:

V	1 to 3	R1	to	R2	to	R3	1 to 3	R4	1 to 2
---	--------	----	----	----	----	----	--------	----	--------

NUMBER OF FLORETS / INFLORESCENCE:**AVERAGE:**

V	2	R1		R2		R3	10	R4	3
---	---	----	--	----	--	----	----	----	---

RANGE:

V	1 to 4	R1	to	R2	to	R3	9 to 11	R4	3 to 5
---	--------	----	----	----	----	----	---------	----	--------

OROLLA INNER SURFACE COLOR: Measure predominant color of newly open flower and circle the appropriate color chart
Royal Horticulture Society Color Chart value or Munsell Color Chart value

V	5RP 7/4	R1		R2		R3	WHITE	R4	WHITE
---	---------	----	--	----	--	----	-------	----	-------

WHITE CORNERS

OROLLA OUTER SURFACE COLOR: Measure predominant color of newly open flower and circle the appropriate color chart
Royal Horticulture Society Color Chart value or Munsell Color Chart value

V	5RP 7/4	R1		R2		R3	WHITE	R4	WHITE
---	---------	----	--	----	--	----	-------	----	-------

COROLLA SHAPE: (See figure 6)

1 = Very rotate; 2 = Rotate; 3 = Pentagonal; 4 = Semi-stellate; 5 = Stellate

V	3	R1		R2		R3	3	R4	4
---	---	----	--	----	--	----	---	----	---

CALYX ANTHOCYANIN COLORATION:

1 = Absent; 3 = Weak; 5 = Medium; 7 = Strong; 9 = Very strong

V	1	R1		R2		R3	1	R4	1
---	---	----	--	----	--	----	---	----	---

ANTHER COLOR: Measure when newly opened flower is fully expanded and circle the appropriate color chartRoyal Horticulture Society Color Chart value or Munsell Color Chart value

V	25Y 8/10	R1		R2		R3	25Y 8/10	R4	25Y 8/10
---	----------	----	--	----	--	----	----------	----	----------

ANTHER SHAPE: (See figure 7)

1 = Broad cone; 2 = Narrow cone; 3 = Pear shape cone; 4 = Loose; 5 = Other _____

V	3	R1		R2		R3	2	R4	2
---	---	----	--	----	--	----	---	----	---

POLLEN PRODUCTION:

1 = None; 3 = Some; 5 = Abundant

V	4 5	R1		R2		R3	1	R4	1
---	-----	----	--	----	--	----	---	----	---

Per letter Sept 28, 2006

LMC

STIGMA SHAPE: (See figure 8)

1 = Capitate; 2 = Clavate; 3 = Bi-lobed

V	1	R1		R2		R3	3	R4	1
---	---	----	--	----	--	----	---	----	---

STIGMA COLOR: Circle the appropriate color chartRoyal Horticulture Society Color Chart value or Munsell Color Chart value

V	2.5 6Y 8/8 56Y 7/6	R1		R2		R3	2.5 6Y 8/8 56Y 7/6	R4	2.5 6Y 8/8 56Y 7/6
---	----------------------------------	----	--	----	--	----	----------------------------------	----	----------------------------------

Per letter Sept 28, 2006
LMC**BERRY PRODUCTION:** Under field conditions

1 = None; 3 = Low; 5 = Moderate; 7 = Heavy; 9 = Very heavy

V	3	R1		R2		R3	1	R4	1
---	---	----	--	----	--	----	---	----	---

5. TUBER CHARACTERISTICS:**PREDOMINANT SKIN COLOR:**

1 = White; 2 = Light Yellow; 3 = Yellow; 4 = Buff; 5 = Tan; 6 = Brown; 7 = Pink; 8 = Red;
 9 = Purplish-red; 10 = Purple; 11 = Dark purple-black; 12 = Other russet

V	+2	5	R1		R2		R3	12	R4	12
---	----	---	----	--	----	--	----	----	----	----

Lmc Per mail 09-26-2006

GIVE COLOR CHART VALUE AND CIRCLE THE APPROPRIATE COLOR CHART

Royal Horticulture Society Color Chart value or Munsell Color Chart value

V	5YR 5/4	R1		R2		R3	5YR 6/4	R4	5Y 4/4
---	---------	----	--	----	--	----	---------	----	--------

SECONDARY SKIN COLOR:

1 = Absent; 2 = Present, please describe _____

V	1	R1		R2		R3	1	R4	1
---	---	----	--	----	--	----	---	----	---

IF PRESENT, GIVE COLOR CHART VALUE AND CIRCLE THE APPROPRIATE COLOR CHART

Royal Horticulture Society Color Chart value or Munsell Color Chart value

V		R1		R2		R3		R4	
---	--	----	--	----	--	----	--	----	--

SECONDARY SKIN COLOR DISTRIBUTION: If present

1 = Eyes; 2 = Eyebrows; 3 = Splashed; 4 = Scattered; 5 = Spectacled; 6 = Stippled; 7 = Other _____

V		R1		R2		R3		R4	
---	--	----	--	----	--	----	--	----	--

SKIN TEXTURE:

1 = Smooth; 2 = Rough (flaky); 3 = Netted; 4 = Russetted; 5 = Heavily russetted; 6 = Other _____

V	4	R1		R2		R3	4	R4	5
---	---	----	--	----	--	----	---	----	---

TUBER SHAPE: (See figure 10)

1 = Compressed; 2 = Round; 3 = Oval; 4 = Oblong; 5 = Long; 6 = Other _____

V	5	R1		R2		R3	5	R4	4
---	---	----	--	----	--	----	---	----	---

TUBE THICKNESS:

1 = Round; 2 = Medium thick; 3 = Slightly flattened; 4 = Flatted; 5 = Other _____

V	2	R1		R2		R3	2	R4	3
---	---	----	--	----	--	----	---	----	---

TUBER LENGTH (mm):

AVERAGE:

V 105

R1

R2

R3 120

R4 110

RANGE:

V 58 to 138

R1 to

R2 to

R3 48 to 142

R4 47 to 115

STANDARD DEVIATION:

V 20.5

R1

R2

R3 18.2

R4 16.0

AVERAGE WEIGHT OF SAMPLE TAKEN:

V 29.2

R1

R2

R3 27.8

R4 29.2

TUBER WIDTH (mm):

AVERAGE:

V 48

R1

R2

R3 52

R4 52

RANGE:

V 37 to 64

R1 to

R2 to

R3 37 to 70

R4 36 to 70

STANDARD DEVIATION:

V 5.7

R1

R2

R3 6.4

R4 7.3

AVERAGE WEIGHT OF SAMPLE TAKEN:

V 29.2

R1

R2

R3 27.8

R4 29.2

TUBER THICKNESS (mm):

AVERAGE:

V 41

R1

R2

R3 43

R4 45

RANGE:

V 32 to 57

R1 to

R2 to

R3 32 to 60

R4 32 to 58

STANDARD DEVIATION:

V 5.2

R1

R2

R3 5.2

R4 5.4

AVERAGE WEIGHT OF SAMPLE TAKEN:

V 29.2

R1

R2

R3 27.8

R4 29.2

TUBER EYE DEPTH:

1 = Protruding; 2 = Shallow; 3 = Intermediate; 4 = Deep; 5 = Very deep

V 2

R1

R2

R3 2

R4 2

TUBER LATERAL EYES

1 = Protruding; 2 = Shallow; 3 = Intermediate; 4 = Deep; 5 = Very deep

V	2	R1		R2		R3	2	R4	2
---	---	----	--	----	--	----	---	----	---

NUMBER EYE / TUBER:**AVERAGE:**

V	12	R1		R2		R3	18	R4	11
---	----	----	--	----	--	----	----	----	----

RANGE:

V	8 to 14	R1	to	R2	to	R3	10 to 20	R4	8 to 13
---	---------	----	----	----	----	----	----------	----	---------

DISTRIBUTION OF TUBER EYES:

1 = Predominantly apical; 2 = Evenly distributed

V	2	R1		R2		R3	2	R4	2
---	---	----	--	----	--	----	---	----	---

PROMINENCE OF TUBER EYEBROWS:

1 = Not prominent; 2 = Slight prominence; 3 = Medium prominence; 4 = Very prominence; 5 = Other

V	1	R1		R2		R3	1	R4	1
---	---	----	--	----	--	----	---	----	---

PRIMARY TUBER FLESH COLOR: Circle the appropriate color chartRoyal Horticulture Society Color Chart value or Munsell Color Chart value

V	WHITE	R1		R2		R3	WHITE	R4	WHITE
---	-------	----	--	----	--	----	-------	----	-------

SECONDARY TUBER FLESH COLOR:

1 = Absent; 2 = Present, please describe

V	1	R1		R2		R3		R4	
---	---	----	--	----	--	----	--	----	--

IF PRESENT, CIRCLE THE APPROPRIATE COLOR CHART:

Royal Horticulture Society Color Chart value or Munsell Color Chart value

V		R1		R2		R3		R4	
---	--	----	--	----	--	----	--	----	--

NUMBER OF TUBER / PLANT:

1 = Low (<8); 2 = Medium (8 -15); 3 = High (>15)

V	2	R1		R2		R3	2	R4	1
---	---	----	--	----	--	----	---	----	---

6. DISEASES CHARACTERISTICS:

DISEASES REACTION: 0 = NOT TESTED; 1 = RESISTANT; 3 = MODERATELY RESISTANT;
5 = MODERATELY SUSCEPTIBLE; 7 = SUSCEPTIBLE; 9 = HIGHLY SUSCEPTIBLE

BACTERIAL RING ROT: Foliar reaction

V	0	R1		R2		R3	0	R4	0
---	---	----	--	----	--	----	---	----	---

BACTERIAL RING ROT: Tuber reaction

V	0	R1		R2		R3	0	R4	0
---	---	----	--	----	--	----	---	----	---

LATE BLIGHT

V	0	R1		R2		R3	0	R4	0
---	---	----	--	----	--	----	---	----	---

PLRV (leaf roll)

V	0	R1		R2		R3	0	R4	0
---	---	----	--	----	--	----	---	----	---

PVX

V	0	R1		R2		R3	0	R4	0
---	---	----	--	----	--	----	---	----	---

PVY

V	3	R1		R2		R3	5	R4	5
---	---	----	--	----	--	----	---	----	---

OTHER: SCAB

V	1	R1		R2		R3	1	R4	3
---	---	----	--	----	--	----	---	----	---

OTHER:

V		R1		R2		R3		R4	
---	--	----	--	----	--	----	--	----	--

7. PESTS CHARACTERISTICS:

PEST REACTION: 0 = NOT TESTED; 1 = RESISTANT; 3 = MODERATELY RESISTANT;
5 = MODERATELY SUSCEPTIBLE; 7 = SUSCEPTIBLE; 9 = HIGHLY SUSCEPTIBLE

GOLDEN NEMATODE

V	0	R1		R2		R3	0	R4	0
---	---	----	--	----	--	----	---	----	---

OTHER:

V		R1		R2		R3		R4	
---	--	----	--	----	--	----	--	----	--

8. GENE TRAITS:

INSERTION OF GENES:

☐

YES

☒

NO

If YES, describe the gene(s) introduced or attach information:

BPA 5/26/05

9. QUALITY CHARACTERISTICS:**CHIEF MARKET:**

DUAL PURPOSE: FRESH MARKET AND FRENCH FRY PROCESSING

SPECIFIC GRAVITY (wt. air / wt. air - wt. water)

1 < 1.060; 2 = 1.060-1.069; 3 = 1.070-1.079; 4 = 1.080-1.089; 5 > 1.090

V 3

R1

R2

R3 3

R4 2

TOTAL GLYCOALKALOID CONTENT (mg. / 100 g. fresh tuber)

V 10.44

R1

R2

R3

R4

per letter Sept 28, 2006
LMC

OTHER QUALITY CHARACTERISTICS: Describe any other quality characteristics that may aid in identification, (e.g. chip-processing, french fry processing, baking, boiling, after-cooking darkening). Please attach data and corresponding protocol.

GOOD FRY COLOR (SEE EXHIBIT B)

11. CHEMICAL IDENTIFICATION:

Describe chemical traits of the candidate variety that aid in its identification (e.g. protein or DNA electrophoresis). Please attach data and the corresponding protocol.

SEE EXHIBIT B FOR ISOZYME PATTERN

12. ADDITIONAL COMMENTS AND CHARACTERISTICS:

Include any additional descriptors that would be useful in distinguishing the candidate variety.

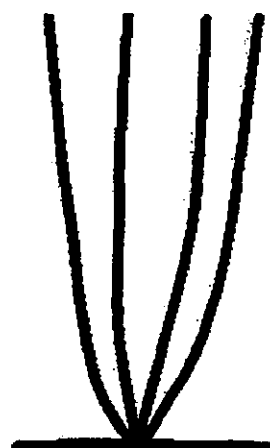
SEE EXHIBIT C FOR TUBER SPROUTS

EXCELLENT TUBER LENGTH INDEX (SEE EXHIBIT B)

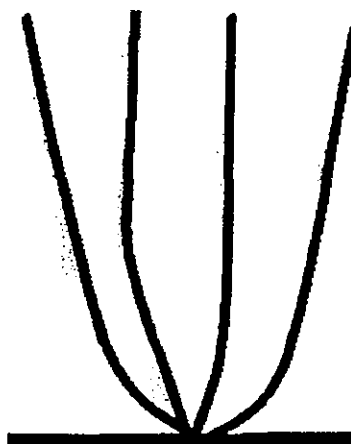
Exhibit C

Description of tuber sprouts grown under diffuse light

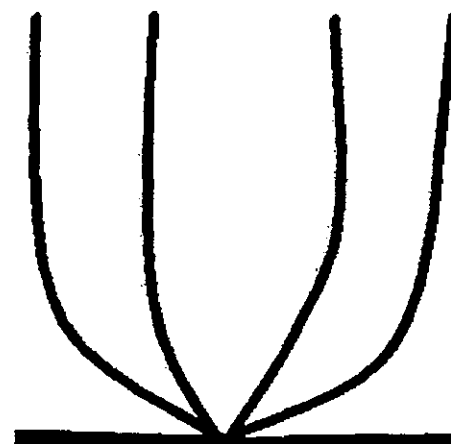
Light Sprout Characteristics	W 1348	Russet Burbank	Russet Norkotah
General shape: 1 = spherical, 2 = ovoidal, 3 = conical, 4 = broad conical	3	2	2
Base: Pubescence 1 = absent, 3 = weak, 5 = medium, 7 = strong	1	1	1
Base: Anthocyanin coloration 1 = green, 2 = red-violet, 3 = blue-violet, 4 = other	1	1	1
Base: Intensity of anthocyanin coloration 1 = absent, 3 = weak, 5 = medium, 7 = strong, 9 = very strong	3	3	3
Tip: Habit 3 = closed, 5 = medium, 7 = open	3	5	5
Tip: Pubescence 1 = absent, 3 = weak, 5 = medium, 7 = strong	3	5	3
Tip: Anthocyanin coloration 1 = green, 2 = red-violet, 3 = blue-violet, 4 = other - reddish green	2	2	4
Tip: Intensity of anthocyanin coloration 1 = absent, 3 = weak, 5 = medium, 7 = strong, 9 = very strong	3	5	3
Root initials: frequency 3 = low, 5 = medium, 7 = high	5	5	7
Protrusion of lenticels 3 = weak, 5 = medium, 7 = strong	5	5	7
Length of lateral shoots 3 = short, 5 = medium, 7 = long	3	5	3

Figure 1: Growth Habit

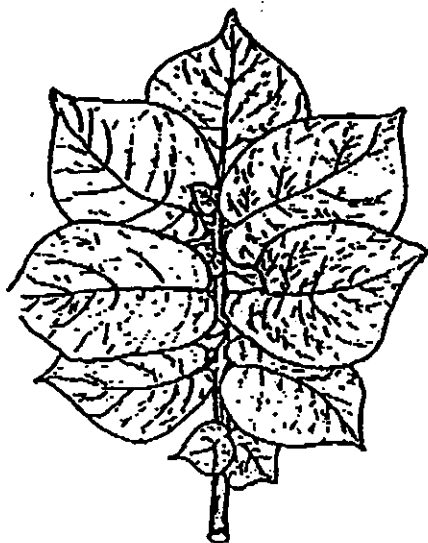
3 = Erect
 $>45^\circ$ with ground



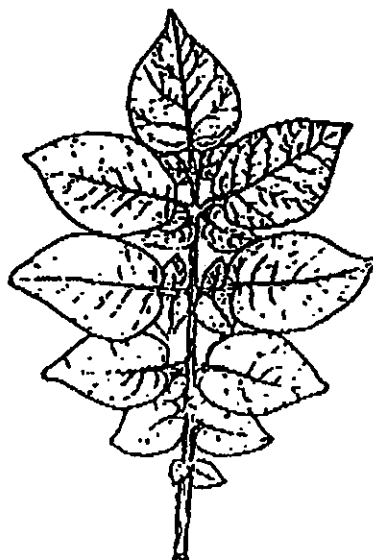
5 = Semi-erect
 $30-45^\circ$ with ground



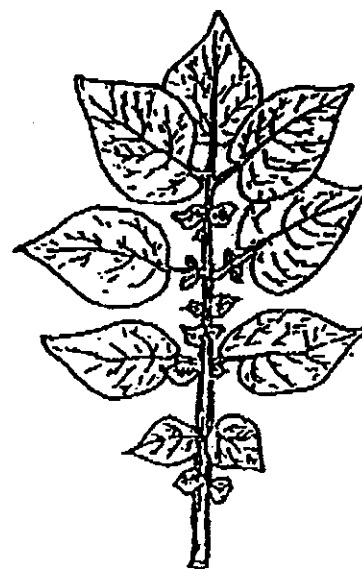
7 = Spreading
 $<30^\circ$ with ground

Figure 2: Leaf Silhouette

1 = Closed



3 = Medium



5 = Open

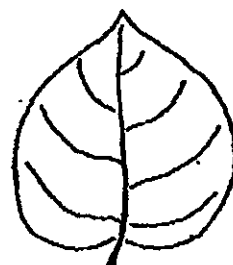
Figure 3: Terminal Leaflet Shape / Primary Leaflet Shape



**1=Narrowly
Ovate**



**2=Medium
Ovate**



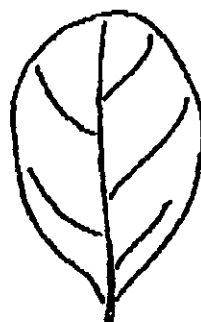
**3=Broadly
Ovate**



4=Lanceolate



5=Elliptical



6=Obovate



7=Oblong

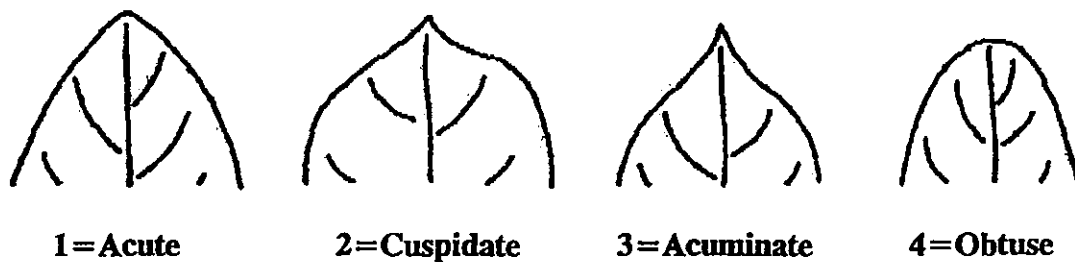
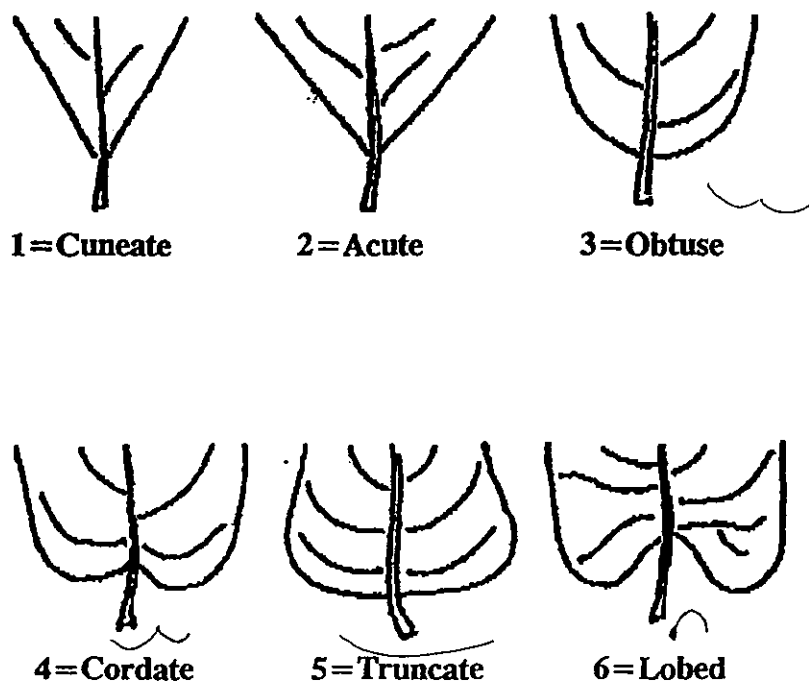
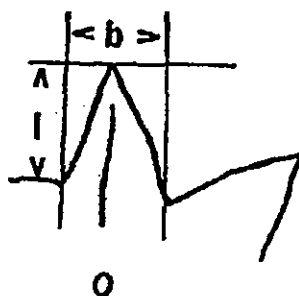
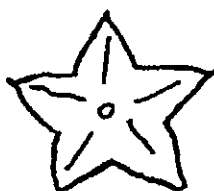
Figure 4: Terminal Leaflet Shape of Tip / Primary Leaflet Shape of Tip**Figure 5: Terminal Leaflet Shape of Base / Primary Leaflet Shape of Base**

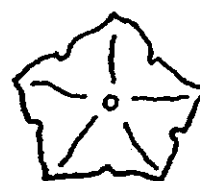
Figure 6: Corolla Shape



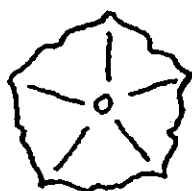
stellate
 $l > b$



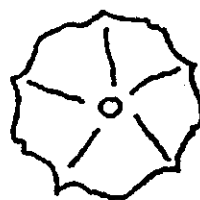
semi-stellate
 $l = b$



pentagonal
 $l < b$



rotate
 $l \ll b$



very rotate
 $l \lll b$

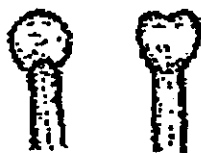
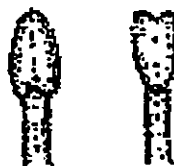
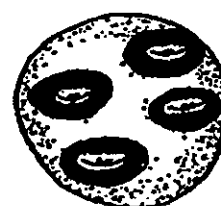
Figure 7: Anther Shape**1=Broad cone****2=Narrow cone****3=Pear shape cone****4=Loose****Figure 8: Stigma Shape****1=Capitate****2=Clavate****3=Bilobed****Figure 9: Distribution of Secondary Tuber Color****1=Eyes****2=Eyebrows****3=Splashed****4=Scattered****5=Spectacled****6=Stippled**

Figure 10: Tuber Shape

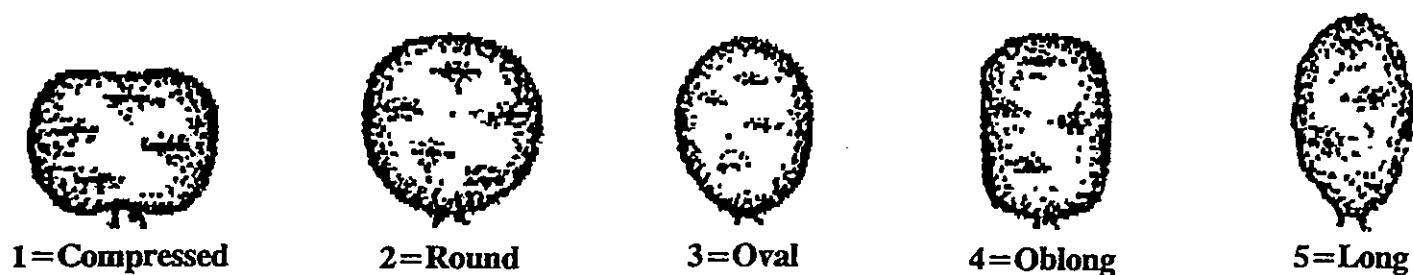


Figure 11: Leaf Dissection

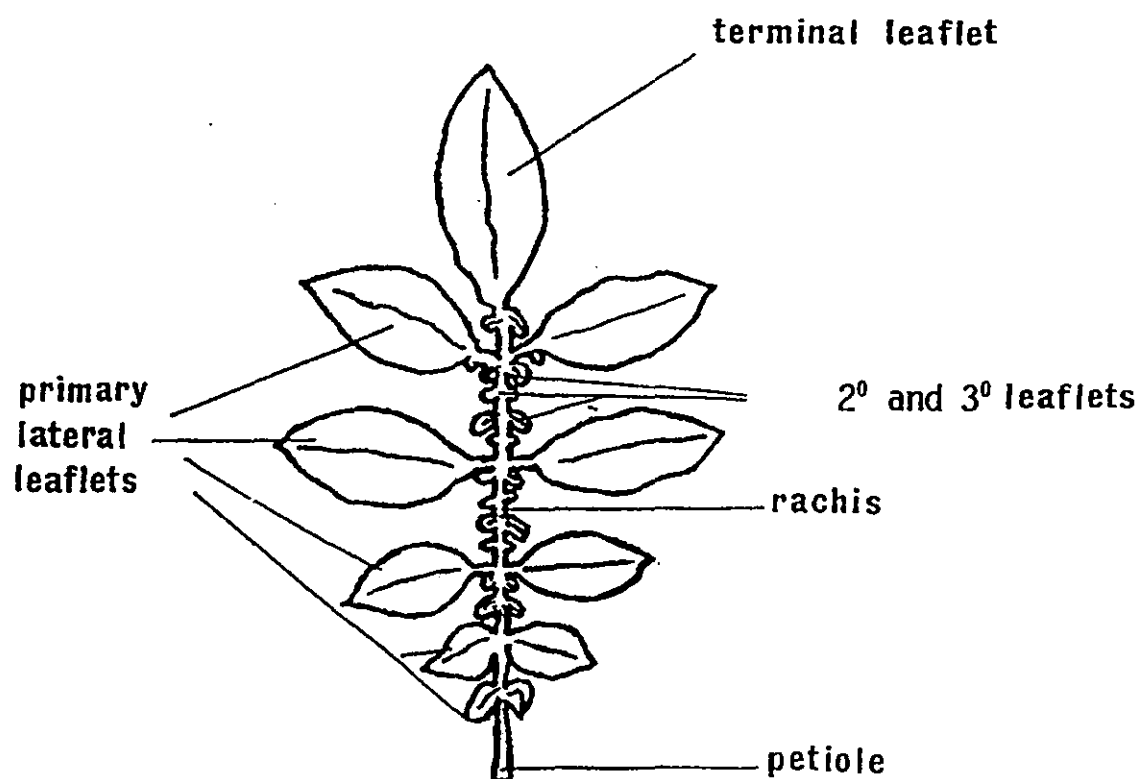


Figure: 12 Stem Wings

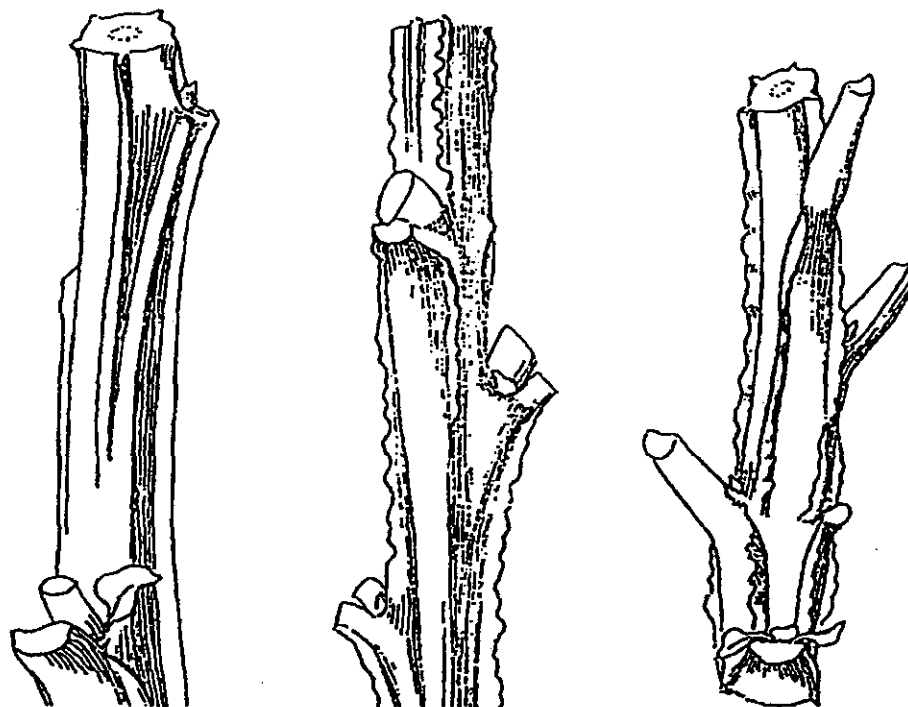


Figure 13: Leaf Stipules:

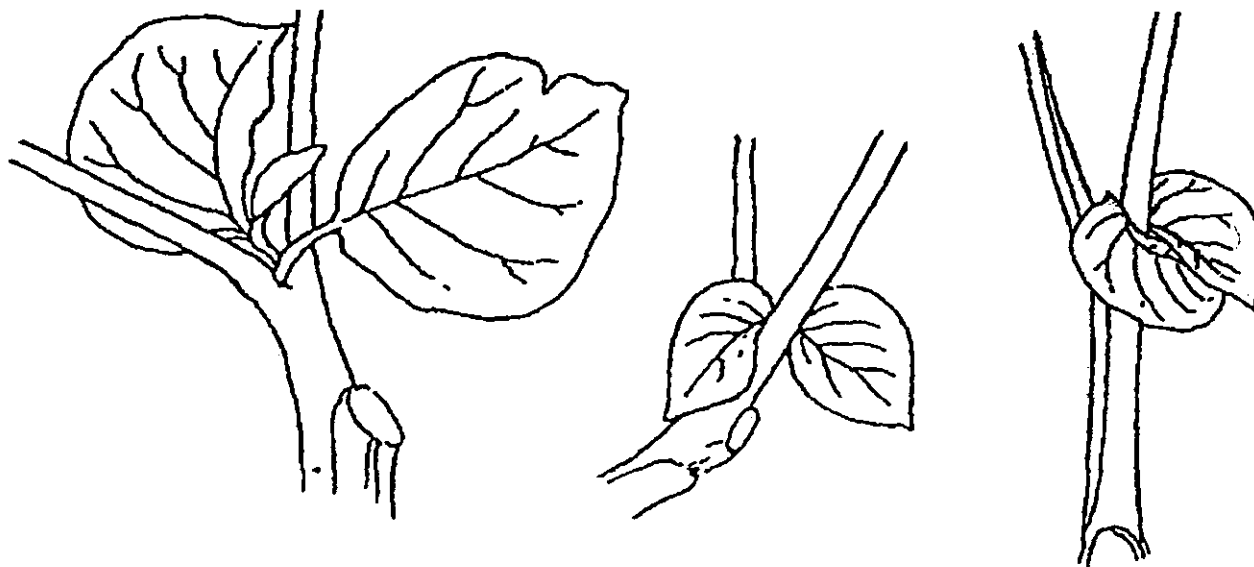


EXHIBIT D

#200100041

2000 MAINE POTATO VARIETY TRIALS
NE184 REGIONAL TRIALS AND ADVANCED BREEDING LINES
EXETER, PRESQUE ISLE, AND ST. AGATHA, MAINE

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Mimeo 2000-02

#200100041

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ACKNOWLEDGMENTS

This project represents the combined efforts of many people and we are appreciative of all those involved. Most of the funding comes from the University of Maine and a USDA-CREES grant (Potato Variety Development and Evaluation in Maine and the Northeast). We greatly appreciate the field sites and management provided by our grower cooperators during 2000 (Crane Farms, Inc. for the Exeter site and Labrie Farms, Inc. for the St. Agatha site). Many thanks to the Maine Seed Potato Board, Maine Potato Breeding Program, Cornell University, North Dakota State University, University of Wisconsin, and USDA Potato Breeding Program (Beltsville, MD and Aberdeen, ID) for providing seed potatoes for these trials.

#200100041

1

Maine

G.A. Porter, J.A. Sisson, B. MacFarlane, and P. Wardwell
University of Maine, Orono, ME 04469

Introduction: Potato variety trials were conducted at three locations in Maine as part of the NE184 Regional Project (Development of New Potato Clones for Environmental and Economic Sustainability in the Northeast). Thirty-seven potato varieties and clones were tested at Aroostook Research Farm, Presque Isle, Maine. Twenty NE184 varieties and lines were tested on a commercial farm in Exeter (central Maine), while thirty varieties and lines were tested on a commercial farm in St. Agatha (northern Maine). Additional trials of advanced selections (pre-regional trial entries) from the USDA-ARS program in Beltsville and the Maine Potato Breeding Program were conducted at the two commercial locations. The primary objective of all of the Maine trials is to determine performance, quality, and storage characteristics of promising potato clones and new varieties in Maine.

Methods: Single-row plots, 25 feet long, were utilized for the NE184 trials. The plot length for the advanced selection trials was 20 feet. All trials were hand planted using randomized complete block designs and four replications. The seedpiece spacing used for each line is listed in subsequent tables. Details of important management practices are presented in Maine Table 1. At the Presque Isle site the varieties were grouped so that separate tests could be vinekilled and harvested based on maturity classification. Remaining cultural practices were similar to those used on commercial farms in the area. Specific gravity was determined at harvest using the weight-in-air/weight-in-water method. Hollow heart ratings indicate the number of hollow tubers observed per 40 large tubers examined. Unless noted otherwise chip color evaluations were conducted during December following storage at 50°F. Chips were fried at 350°F for three minutes and evaluated using an Agtron M35, calibrated with the black "0" disk = 0 and the white "90" disk = 90. Chips were crushed and reported values are means from four replicates per variety. Each sample was read three times with thorough mixing between readings.

Skinning and shatter bruise were measured soon after harvest. Approximately 10 lbs of tubers that exceeded 1 1/4" diameter were tumbled in a drum with three stones for 1 minute at 15 rpm. Each tuber was then rated for percentage of the tuber surface affected by skinning or shatter bruise. The tubers were then placed in 45°F storage and rated for internal damage during February. An additional abrasive peel test was conducted on separate samples to determine biochemical aspects of blackspot bruise susceptibility (see Pavuk et al, APJ 62:511-517). Ten tubers per plot were warmed for 24 hours and then abrasively peeled for 30 seconds. Color was allowed to develop for 24 h and then individual tubers were rated for discoloration where 0=no discoloration and 5=severe discoloration.

Results

Rainfall, General Growth, and Plant Stands. Rainfall by month and location is listed in Maine Table 2. The crop generally received a good

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supply of water from rainfall during 2000. The Presque Isle site had the lowest rainfall during June through August. Irrigation was applied at the Central Maine site to compensate for relatively low August rainfall. Plant growth was generally quite good at all three sites. Pest control practices were very effective. No late blight infection was observed in the 2000 trials. Lines with relatively poor early vigor at Presque Isle were Eva, Gem Russet, Yukon Gold, A84118-3, A84180-8, B0766-3, B1102-3, B1492-12, and CO86218-2. Slight to moderate foliar chlorosis, presumably in response to the herbicide program, was observed on June 23 for the following lines: Snowden, AF1437-1, B1495-6, CO86218-2, and NY102. Eva (NY103) and Shepody had moderate foliar chlorosis on June 23. AF1437-1, AF1668-60, B0766-3, and B1240-1 had relatively poor early vigor at Exeter. Snowden and B1240-1 were chlorotic in June at Exeter. Gem Russet, A84118-3, A84180-8, AF1846-2, AF2061-2, and CO86218-2 had relatively poor early vigor at St. Agatha. Russet Legend had pronounced marginal leaf necrosis and died very early, especially at Presque Isle. We have consistently observed this problem in Russet Legend. Plant stand equaled or exceeded 90% of targets for most NE-184 lines. The only exceptions at Presque Isle were B0766-3 (87%) and A84118-3 (86%). Eva (89%), Shepody (88%), Yukon Gold (88%), and A84118-3 (85%) had relatively poor stands at St. Agatha. In the advanced selection trials relatively poor stands were observed in AF1668-60 (86%), AF1921-9 (74%), AF1475-20 (89%), AF1846-2 (60%), B0811-4 (89%), B1491-5 (78%), B1495-6 (89%), and SC8801-2 (89%). Yields were quite high at all three sites.

Aroostook Research Farm NE184 Regional Potato Variety Trials. Dark Red Norland and Superior were particularly early maturing in the early/medium-early trial. AF1763-2 significantly exceeded Superior in total and U.S. #1 yields (Maine Table 3). The red test lines produced significantly lower yields than Chieftain; however, yields of CO86218-2 were statistically equal to those of Dark Red Norland. Atlantic was the only high specific gravity line in the test. Tuber size was small in the test and even the two best lines, Superior and AF1437-1 were relatively small for table use. CO86218-2 and W1874-1R were attractive reds (Maine Table 4). AF1437-1 had good appearance in the round-white trial. There were relatively few external tuber defects in this trial; however AF1437-1 had 4% growth cracks. Hollow heart was not a problem. AF1437-1 was relatively susceptible to shatter bruise; while the two new reds, CO86218-2 and W1874-1R, were susceptible to skinning. Based on overall performance in the test, AF1763-2 was the most promising round-white and CO86218-2 was the most promising red; however, small tuber size was a problem in the former, while susceptibility to skinning may limit the latter's utility in Maine.

NY112 and W1443 exceeded Atlantic in total and U.S.#1 yields in the mid-season trial (Maine Table 5). Kennebec, NY102, W1242, and W1431 had significantly lower U.S.#1 yields than Atlantic. Eva, Kennebec, B0766-3, and NY112 sized well for table use. Snowden, NY115, and W1431 had particularly small tubers. Atlantic, Snowden, B0766-3, NY102, NY112, W1242, W1313, and W1431 specific gravities were very high. There were relatively few external tuber defects in this test (Maine Table 6); however, Kennebec had greater than 10% sunburn. Atlantic had considerable hollow heart (7.5%). B0766-3 had high shatter bruise incidence. Tubers of Eva were rated particularly attractive.

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Chip colors were generally good. Kennebec, W1313, and W1431 had some color problems, while NY115 produced the lightest chips in the test. NY112 was the strongest chipping prospect in this test. W1443 also showed promise for chipping; however, specific gravity may be too low. Eva remains promising for table use.

In the late maturity trial, all three test lines were high yielding, but they did not produce significantly higher total or U.S.#1 yields than Katahdin (Maine Table 5). AF1475-20 sized well for table and AF1758-7 had fairly good tuber size. Specific gravity of AF1758-7 was significantly lower than Katahdin. AF1615-1 and AF1758-7 had attractive tubers (Maine Table 6). AF1475-20 (sunburn, off shapes, growth cracks) had more than 13% external defects and poor overall tuber appearance. AF1615-1 also had high external defects incidence (12%, mostly sunburn; some off shapes). There were no hollow heart problems in this test. AF1758-7 was the best prospect based on these test results. AF1615-1 performance was poorer than usual due to small tuber size and high external defects incidence.

Gem Russet, Russet Burbank, Russet Norkotah #3, Umatilla Russet, and A84118-3 were late maturing in the russet or long-type variety test; Russet Norkotah was early maturing (Maine Table 7). None of the test lines had significantly higher total or U.S.#1 yields than Russet Burbank or Russet Norkotah. Russet Legend, Shepody, A84118-3, A84180-8, A087277-6 and W1348Rus had significantly lower U.S. #1 yields than both standard varieties. Russet Norkotah #3, Russet Norkotah #8, Shepody, A84180-8, A087277-6 had larger tuber size than Russet Burbank. Russet Legend and W1348Rus sized poorly. Russet Legend died early and had relatively low specific gravity in addition to small tuber size. Specific gravities for the remaining test lines were similar to Russet Burbank or higher. Tubers of Gem Russet and the Russet Norkotah lines were the most attractive (Maine Table 8). Umatilla Russet, A84118-3, and W1348Rus had more than 10% misshapen tubers. A84180-8 (12.6%) and Umatilla Russet (5.2%) had high incidence of growth cracks. Shepody and A087277-6 had high levels of scab incidence. Russet Norkotah #3, Shepody, A84118-3, and A84180-8 had high levels of skinning in this study. Russet Legend, Umatilla Russet, A84180-8, A087277-6, and W1348Rus had poor shatter bruise scores. No hollow heart was observed in this test. Russet Norkotah #3 and Russet Norkotah #8 had significantly poorer chip color scores than Russet Burbank. Gem Russet, Russet Legend, A84118-3, and W1348Rus had better chip color scores than Russet Burbank. Overall, I liked Russet Norkotah #8 and Gem Russet in this trial.

Central Maine NE184 Regional Potato Variety Trial. Kennebec and NY112 total yields were significantly higher than Atlantic (Maine Table 9). AF1758-7 and NY112 had U.S.#1 yields which exceeded those of Atlantic. Katahdin, Yukon Gold, AF1668-60, FL1625, FL1833, and W1242 had significantly lower U.S. #1 yields than Atlantic. Snowden, NY115, and W1242 did not size well. Specific gravities of Atlantic, Snowden, FL1625, and W1313 exceeded 1.090. AF1437-1 and AF1758-7 had very low specific gravity. Incidence of external defects equaled or exceeded 30% for Atlantic, Katahdin, Kennebec, Yukon Gold, AF1437-1, AF1615-1, B0766-3, FL1533, FL1625, FL1833, and W1242 (Maine Table 10). Usually, the most prevalent defect was sunburn; however, AF1437-1 had 8%

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growth-cracked tubers. Katahdin, Yukon Gold, and FL1833 had greater than 5% scab incidence. Katahdin and AF1668-60 had high levels of skinning. Superior, AF1437-1, B0766-3, and FL1833 were very susceptible to shatter bruise. Hollow heart was not common in this study. Eva, AF1668-60, B0766-3, FL1533, FL1833, NY102, NY115, and W1242 had significantly better chip color scores than Atlantic. Eva, AF1615-1, and AF1758-7 were the most promising tablestock lines in this test. Considering all attributes, the best performing new chipping lines in this test were NY102, NY112, and W1313.

Northern Aroostook County NE184 Regional Potato Variety Trials. None of the round-white varieties produced significantly higher total yields than Atlantic; however, yields of Chieftain, AF1758-7, and NY112 were very high (Maine Table 11). Snowden, CO86218-2, and NY102 had very low yields in this trial. Atlantic, Snowden, Yukon Gold, NY102, and NY112 specific gravities exceeded 1.090. AF1437-1 had very low specific gravity. Dark Red Norland, Snowden, NY102, NY115, W1874-1R sized very poorly and very few lines sized well for table use. Scab was a problem at this site and only AF1615-1, AF1763-2, NY102, and the reds had good tuber appearance ratings (Maine Table 12). Chieftain, Superior, AF1615-1, AF1758-7, NY102, W1874-1R had the lowest incidence of external tuber defects. Scab, sunburn, and off shapes were common problems; however, AF1437-1 had 37% growth cracks. Chieftain, AF1437-1, and B0766-3 were particularly susceptible to shatter bruise. These plots were harvested after cold weather began and only NY102's chip color remained good under these conditions. The two new reds were pretty, but low yielding. AF1615-1 and AF1758-7 were the best tablestock prospects in this test. NY112 was the most promising chipping line in the test.

In the russet or long-type variety test, Russet Burbank, A84118-3, and A84180-8 were very late maturing. Five lines were equal to Russet Burbank in total and U.S.#1 yields and none exceeded Russet Burbank (Maine Table 13). Gem Russet, Russet Legend, A84118-3, A84180-8, and W1348Rus had significantly lower U.S.#1 yields than Russet Burbank. Russet Norkotah, Russet Norkotah #3, Russet Norkotah #8, Shepody, and A84180-8 had larger tuber size than Russet Burbank. Russet Legend and W1348Rus had higher specific gravity than Russet Burbank, while A84180-8 was significantly lower. Tubers of Russet Norkotah, Russet Norkotah #8, and Umatilla Russet were particularly attractive (Maine Table 14). Shepody had nearly 50% external defects (sunburn, off shapes, scab), while A84118-3 (misshapen) and A84180-8 (misshapen, growth cracks) had more than 20% external defects. Russet Burbank, Shepody, and A84118-3 had 5% or more hollow heart. Shepody, Umatilla Russet, and A84180-8 had the highest incidence of shatter bruise. Gem Russet, Russet Legend, and W1348Rus had significantly better chip color scores than Russet Burbank. None of the test lines did well in all attributes; however, Russet norkotah #8 and Umatilla Russet provided the best overall performance among the test lines.

French Fry Processing from the 1999 Aroostook Research Farm Test. French fry color and texture of 15 NE184 lines were evaluated under simulated processing conditions (Maine Table 15). Gem Russet, Russet Legend, A81386-1, and A84118-3 produced french fries that were equal to Russet Burbank in quality. Texture scores for Gem Russet, Russet Legend, Shepody, A81386-1.

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A84118-3, A84180-8, A86102-6, and W1348Rus were statistically equal to those of Russet Burbank.

Arroostook Research Farm Small-scale Storage Evaluations. Limited data on storage and processing characteristics were collected from 47 NE184 varieties and clones during the 1999-2000 storage season (Maine Tables 16 and 17). Chip colors from 50°F storage in February were acceptable for many lines with anticipated chipping potential. Lines with outstanding chip color from 50°F February storage were: B0766-3, ND2676-10, and NY115. MaineChip, ND2676-10, NY115, and W1313 produced good chip colors directly from 45°F storage; however, none of the lines produced good chips directly out of 38°F storage. Snowden reconditioned well from 38°F storage. Eva, B0766-3, and W1313 provided good chip colors through late April evaluations.

Chipping of samples from the Exeter site took place in March. Lines with particularly good color from 50°F storage were: Atlantic, Eva, Itasca, Keuka Gold, Snowden, B0766-3, ND2776-10, and NY115. ND2776-10 and NY115 produced the best chips from 45°F storage; however, the following lines reconditioned well from 45°F storage: Eva, Itasca, Keuka Gold, MaineChip, FL1533, FL1625, and ND2776-10.

Skinning and bruise test scores for the 1999 field season are presented in Maine Table 16. The following lines had particularly poor skinning scores: Atlantic, Itasca, Katahdin, Russet Legend, Russet Norkotah #3, Umatilla Russet, A81386-1, A84118-3, W1100R, W1101R, and W1348Rus. Dark Red Norland, Kennebec, Russet Legend, Umatilla Russet, A84180-8, AF1437-1, ND2776-10, W1100R, and W1313 had relatively high shatter bruise scores. Internal bruising problems were detected in Atlantic, Kennebec, B0766-3, W1100R, and W1313. Atlantic, Chieftain, Dark Red Norland, Keuka Gold, Lady Claire, Russet Legend, Umatilla Russet, Yukon Gold, A86102-6, NY115, and W1151Rus had fair blackspot bruise potential scores. Eva, Shepody, AF1615-1, ND2776-10, W1099Rus, and W1313 had good scores. All other lines showed high blackspot bruise potential.

Eva, Gem Russet, Russet Burbank, A84118-3, A84180-8, and A86102-6 required at least 200 days to reach the one-half-inch sprout stage. Accord, Cycloon, Lady Christyl, and NorDonna reached the one-half-inch sprout stage in less than 130 days. Selections with very low weight loss (<3.5%) from 38°F storage were: Accent, Lady Christyl, Superior, Shepody, and B0766-3. Selections with very low weight loss (7% or less) from 50°F storage were: Eva, Gem Russet, Russet Burbank, Russet Legend, Russet Norkotah, Russet Norkotah #3, Russet Norkotah #8, Shepody, Yukon Gold, A81386-1, A84118-3, A84180-2, and A86102-6. Selections with high weight loss (15% or more) from 50°F storage were: Atlantic, Cycloon, Dark Red Norland, Lady Christyl, MaineChip, Snowden, AF1615-1, W1099Rus, W1100R, and W1101R.

Central Maine Advanced Breeding Lines. AF1668-60 and AF1921-9 were significantly lower yielding than all standards (Maine Table 18). B0178-34 and B1327-6 produced the highest U.S.#1 yields of the test lines. Specific gravities of AF1845-7, AF1921-4, AF1921-9, and FL1533 were less than 1.085. AF1845-7, AF1949-1, and B1327-6 had very small tuber size. B1240-1 and FL1625

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were very late maturing (Maine Table 19). Sunburn was the major tuber defect in the trial. Atlantic, AF1775-2, AF1921-4, AF1921-9, B1240-1, and FL1533 had >15% sunburn. Several other external defect problems were observed: AF1775-2 (off shapes), AF1921-4 (off shapes), AF1921-9 (off shapes), AF1949-1 (growth cracks), B0178-34 (scab), B1240-1 (scab), B1327-6 (scab), FL1533 (growth cracks), and FL1625 (off shapes). There was very little hollow heart in this trial; however, AF1755-2 had 7.5% incidence in the larger tubers. Nearly all lines had very good chip color in this test. Only AF1921-4, AF1921-9, and AF1949-1 had significantly poorer chip color scores than Atlantic. Considering all attributes, the most promising numbered chipping line in this test was B1327-6.

Northern Aroostook County Advanced Breeding Lines. None of the lines produced significantly higher total or U.S.#1 yields than Atlantic in the advanced round-white variety test (Maine Table 20). AF1291-44, AF1611-9, AF1846-2, AF1938-3, ARS-W95-6527-1, ARS-W95-6550-2, B1497-22, B1598-4, and B1752-5 produced significantly lower U.S.#1 yields. AF1470-6 had a specific gravity less than 1.070. ARS-W95-6498-5, ARS-W95-6527-1, ARS-W95-6550-2, ARS-W95-6553-1, B1425-9, B1591-1, B1598-4, W1431, and W1443 had very small tuber size. AF1475-20 and AF1846-2 were very late maturing (Maine Table 21). Katahdin, Kennebec, AF1291-44, AF1611-9, AF1938-3, ARS-W95-6550-2, B1425-9, B1497-22, B1598-4, B1722-5, and B1752-5 had more than 15% scab. Kennebec, AF1569-2, and AF1938-3 had more than 10% sunburn. AF1470-6, AF1569-2, AF1611-9, AF1938-3, and B1591-1 had more than 5% growth-cracked tubers. Atlantic, AF1938-3, ARS-W95-6498-5, B1624-22, and W1443 \geq 5% hollow heart out of 40 large tubers examined. Considering all attributes, the numbered lines in this test that were considered worthy of continued evaluation were: AF1764-3, ARS-W95-6553-1, SC8801-2, and W1443.

In the advanced russet or long-type variety test, only AF1753-16 produced significantly higher total yields than Russet Burbank (Maine Table 22). AF2061-2, AF2129-1, and B1649-8 were significantly lower yielding than Russet Burbank. AF2061-2 and AF2129-1 had specific gravities less than 1.085. B1463-1 and B1649-1 had very small tubers. B1409-2 had the best tuber appearance (Maine Table 23). Shepody, AF1753-16, AF2061-2, B1649-8, and MN15620 had more than 10% misshapen tubers. B1463-1 had more than 5% growth-cracked tubers. Russet Burbank \geq 5% hollow heart out of 40 large tubers examined. B1463-1 and MN15620 had significantly better chip color than Russet Burbank. Considering all attributes, the numbered lines in this test that were considered worthy of continued evaluation were: AF1753-16, B1409-2, and B1649-8.

Presque Isle Advanced Red- and Purple-skinned Breeding Lines. None of the test lines had U.S.#1 yields which were equal to Dark Red Norland (Maine Table 24). B1102-3, B1495-6, and B1529-1 had very good tuber appearance ratings; however, B1102-3 and B1529-1 were more susceptible to skinning than the other lines (Maine Table 25). Considering all attributes, the numbered lines in this test that were considered worthy of continued evaluation were: B1102-3, B1145-2, B1491-5, B1495-6, and B1529-1.

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B1523-4 was the best prospect red prospect in the 1999 trial. Bruise tests conducted in 1999 showed that it was relatively susceptible to skinning, but that it had good skin color from storage (Maine Table 26). B1495-6 and B1495-15 were especially susceptible to skinning, while B1145-2 was especially susceptible to shatter bruise. B1495-6, B1521-2, B1523-4, and B1529-1 had very good skin color from storage.

Miscellaneous Bruise Test Results from the 1999 Growing Season. Bruise test and blackspot bruise potential results from the 1999 Central Maine and St. Agatha experiments are presented in Maine Tables 27 and 28.

Promising Selections in the 2000 NE184 Regional Variety Trials.

Selections that performed particularly well in the 2000 regional trials were: Eva and AF1758-7 (medium to late maturing, table lines); NY112 (mid-season chipstock line, alternative to Atlantic); Russet Norkotah #8 (mid- to late-season fresh market russet). Gem Russet (russet) is the most promising NE184 variety for french fry processing; however, slow emergence hampered its performance at one of two sites during 2000. W1443 showed promise for chipping; however, its specific gravity may not be high enough. Umatilla Russet (russet), AF1615-1 (round, table), AF1763-2 (round, table), CO86218-2 (red, table), and W1313 (chipping) were also promising, but were not consistent over locations.

Maine Table 7. Yield, marketable yield, percentage of yield by grade size distribution, and specific gravity for 12 russeted/processing varieties grown at Presque Isle, Maine - 2000. (NE184 Regional Potato Variety Trials)

Variety	Total		US\$1 Yield (cwt/A) ¹ %			50% Emerg. Date	Size Distribution by Class ³ (%)										Spec. Grav.
	Yield cwt/A	% of std.	>1 1/2"	% of std.	>4 oz. (spacing) ²		% by wt. % by length										
							1	2	3	4	5	>8 oz.	>12oz.	>3"	>3 1/2"		
<u>Russet/Processing Test - 119 days</u>																	
R. Burbank (std)	338	319	100	203	100(16)	6-14	36	45	18	1	0	19	1	62	47	1.093	
Gem Russet	256	220	69	149	100(16)	6-22	38	47	14	0	1	15	1	60	43	1.099	
R. Legend	136	121	38	70	100(16)	6-13	44	47	8	0	0	8	0	52	26	1.085	
R. Norkotah	327	303	95	212	99(14)	6-16	30	47	18	4	1	23	5	66	46	1.088	
R. Norkotah #3	333	284	89	224	100(14)	6-17	21	42	25	9	3	37	12	75	55	1.091	
R. Norkotah #8	303	275	86	221	98(14)	6-17	20	48	22	8	2	32	10	77	58	1.090	
Shepody	322	224	70	198	96(10)	6-19	12	33	38	12	4	55	16	87	77	1.093	
Umatilla R.	342	273	86	188	100(16)	6-16	31	40	20	4	4	28	8	66	54	1.094	
A84118-3	224	189	59	128	86(16)	6-24	33	45	17	5	0	22	5	66	49	1.098	
A84180-8	288	224	70	183	98(16)	6-20	19	51	24	5	1	31	6	81	67	1.089	
A087277-6	332	222	70	174	95(16)	6-19	22	46	27	4	0	32	5	79	65	1.103	
W1348Rus	291	237	74	161	100(16)	6-15	33	50	14	3	0	17	3	64	44	1.106	
W. Duncan LSD	50	49		48								12	5	10	11	0.006	

¹U.S.#1 for the russet/proc. varieties = yield > 1-1/2", excluding external defects, and yield > 4 oz. tubers, excluding external defects, respectively.

²Inches between seedpieces noted within parentheses.

³Size classes for russeted/processing varieties: 1= <4 oz.; 2=4 to 8 oz.; 3=8 to 12 oz.; 4=12 to 16 oz.; 5= >16 oz.

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Main Table 8. Plant size, maturity at vinekill, tuber shape, tuber defects, hollow heart ratings, and chip colors for 12 russeted/processing varieties grown at Presque Isle, Maine - 2000. (NE184 Regional Potato Variety Trials)

Variety	Plant Data ¹		Tuber Data ¹			Tuber Defects (%)							Hollow			
	Size 8-17	Maturity 9-1 OKV	Skin- ning ²	Shat- ter ³	Skin Tex- Bruise ⁴	Appear- Shape ance ⁵	Total	Sun- burn	Mis- shapen	Growth cracks	Scab	Rot	Rating ⁷	Heart Color ⁸		
<u>Russet/Processing Test - 119 days</u>																
R. Burbank (std)	7	7	5.8	1.87	1.83	1	7	2	5.8	1.4	3.0	1.0	0.4	0.0	0	52
Gem Russet	7	6	6.3	1.71	1.33	4	7	6	10.2	1.6	5.6	0.0	2.8	0.2	0	60
R. Legend	3	3	2.3	1.70	2.06	4	6	5	11.0	1.0	6.0	2.8	1.2	0.0	0	65
R. Workotah	5	5	2.8	1.39	1.00	3	7	7	7.5	1.7	5.2	0.4	0.1	0.0	0	48dr
R. Workotah #3	8	7	6.5	2.22	1.05	3	6	6	14.2	1.5	11.1	0.0	1.5	0.1	0	44dr
R. Workotah #8	7	6	4.3	2.00	1.04	3	7	7	8.9	2.6	4.6	0.9	0.8	0.0	0	47dr
Shepody	6	5	4.3	2.40	1.84	7	8	4	10.9	9.4	6.5	0.0	14.8	0.2	0	55
Umatilla R.	9	7	5.8	1.70	2.03	4	6	4	21.1	2.3	13.2	5.2	0.0	0.4	0	51
A84118-3	8	8	7.5	4.44	1.34	1	7	4prs	15.5	0.7	13.3	1.3	0.0	0.1	0	60
A84180-8	8	7	5.0	2.22	2.57	3	7	5prs	22.2	1.2	8.3	12.6	0.0	0.1	0	55
A087277-6	8	7	6.8	2.00	2.39	4	7	5ps	31.0	2.1	8.1	1.2	19.5	0.1	0	55
W1348Rus	7	5	4.6	1.96	2.26	4	6	5	19.0	3.3	13.8	0.3	1.5	0.0	0	61

¹See standard NE184 rating system for key to codes. prs=many pear-shaped tubers; ps=pointed ends.

²Hollow heart rating equals the number of hollow tubers found per 40 large tubers cut and examined.

³Chip color from 50F -- Agtron M35 (higher values indicate lighter color); >60 acceptable; dr=dark vascular ring; ds=dark stem-end of tuber. The chipping date was December 1, 2000. Waller Duncan LSD (K=100) for chip color = 5.

⁴Skinner and shatter bruise were measured on October 3, 2000. Data presented represent indices where: 1=all tubers have 0% of surface affected and 9=all tubers have 100% of surface affected.

Maine Table 13. Yield, marketable yield, percentage of yield by grade size distribution, and specific gravity for 11 russet/processing (long-tuber-type) varieties and NE-184 regional trial lines grown at St. Agatha, Maine - 2000. (NE184 Regional Potato Variety Trials)

Variety	Total	US#1 Yield (cwt/A) ¹		% Stand (spacing) ²	Size Distribution by Class ³ (%)										Spec. Grav.
	Yield cwt/A	>1½"	% of std. 4 oz.		>	>	by length								
							>3"	>3½"							
<u>St. Agatha NE-184 Russet/processing Test- 104 days</u>															
R. Burbank (std)	343	300	100	210	100(16)	30	55	12	3	0	15	3	70	44	1.086
Gem Russet	197	172	57	122	90(16)	28	54	16	1	0	18	1	74	50	1.086
R. Legend	270	247	82	184	100(16)	25	59	12	4	0	16	4	70	40	1.095
R. Norkotah	303	287	96	229	100(16)	20	53	23	4	0	27	4	80	57	1.083
R. Norkotah #3	310	292	97	256	99(16)	12	48	30	8	1	39	9	86	60	1.083
R. Norkotah #8	307	288	96	247	99(16)	14	45	30	8	3	41	11	85	69	1.083
Shepody	334	171	57	150	88(16)	12	42	28	13	5	46	18	88	71	1.088
Umatilla R.	362	307	102	226	100(16)	26	49	19	4	1	24	5	72	48	1.084
A84118-3	190	151	50	114	85(16)	24	53	18	2	2	23	4	78	60	1.082
A84180-8	217	165	55	144	98(16)	13	47	34	6	0	40	6	89	74	1.076
W1348Rus	257	213	71	122	100(16)	43	45	11	1	0	12	1	59	30	1.097
Waller Duncan															
LSD (k=100)	64	57		52							12	6	9	12	0.005

¹U.S.#1 yield = yield >1½" excluding external defects.

²Inches between seedpieces noted within parentheses.

³Size classes: 1= <4 oz; 2=4 to 8 oz.; 3=8 to 12 oz.; 4=12 to 16 oz.; 5= >16 oz.

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Maine Table 14. Plant size, maturity at vinekill, tuber shape, tuber defects, hollow heart ratings, and chip color scores for 11 russet/processing (long-tuber-type) varieties and NE-184 regional trial lines grown at St. Agatha, Maine - 2000. (NE184 Regional Potato Variety Trials)

Variety	Plant Data ¹			Tuber Data ¹			Tuber Defects (%)					Hollow			
	Size	Matur.	Skin-	Shat-	Skin	Appear-	Sun-	Mis-	Growth		Heart	Chip			
	8-3	at	ning ⁴	ter	Tex-	Shape	ance	Total	burn	shapen	cracks	Scab	Rot	Rating ²	Color ³
	V. kill		Bruise ⁴ ture												
<u>St. Agatha NE-184 Russet/processing Test- 104 days</u>															
R. Burbank (std)	8	7.8	1.41	1.31	1	7	3nr	12.4	0.5	10.7	1.2	0.0	0.0	3	27
Gem Russet	3	7.0	1.50	1.63	4	6	5	14.2	0.7	11.8	0.0	1.7	0.0	0	37
R. Legend	6	6.3	1.25	1.69	3	6	ptd	8.6	0.2	5.3	2.9	0.0	0.2	1	46
R. Norkotah	5	5.0	1.16	1.04	3	6	6	5.5	0.1	3.9	0.2	0.2	1.2	1	23
R. Norkotah #3	6	7.3	1.00	1.11	3	6	4cs	5.7	0.7	4.7	0.0	0.0	0.3	1	25
R. Norkotah #8	5	6.8	1.52	1.17	3	7	6	6.4	0.9	5.0	0.3	0.3	0.0	1	23
Shepody	7	5.8	1.89	2.16	7	7	4cs	49.5	11.0	17.3	0.0	17.6	3.6	2	26
Umatilla R.	6	7.0	1.64	1.92	4	7	6	15.1	0.7	10.1	3.1	0.0	1.3	0	24
A84118-3	4	7.8	1.85	1.73	4	6	ptd	20.4	0.4	18.1	0.4	0.0	1.4	2	28
A84180-8	2	7.8	1.21	2.04	3	8	5nr	23.4	0.0	14.5	7.8	1.1	0.0	0	26
W1348Rus	7	6.8	1.21	1.44	4	7	5nr	16.9	1.8	6.8	0.0	8.2	0.1	0	42

¹See standard NE184 rating system for key to codes. cs=common scab detracted from tuber appearance; ptd=many tubers with pointed ends; nr=nonuniform russetting.

²Hollow heart rating equals the number of hollow tubers found per 40 large tubers cut and examined.

³Chip color from 45 and 50F -- Agtron M35 (higher values indicate lighter color); >60 acceptable; dr=dark vascular ring and ds=dark stem-end defects in the chips. The chipping data was December 4, 2000. Waller Duncan LSD (K=100) for chip color = 6.

⁴Skinnering and shatter bruise were measured on October 24, 2000. Data presented represent indices where: 1=all tubers have 0% of surface affected and 9=all tubers have 100% of surface affected.

Maine Table 16 cont.

Variety	Chip Color from Storage				Bruise Test Scores ¹			Blackspot Bruise Potential ¹	Days to Indic. Storage Wt.			
	50°F ¹	45°F ¹	38°F ¹	Recond. ¹	Skin- ning	Shatter	Inter- nal		Sprout Length ¹		Loss % ¹	
	PIP	1/4"	3/8"	50°F								
<u>Late Trial:</u>												
Katahdin	60	--	--	--	5.78	1.89	1.44	4.00	111	153	4.7	14.7
Accent	51	--	--	--	1.28	1.33	1.17	3.95	90	132	3.3	10.0
Accord	62	--	--	--	1.45	1.59	1.27	4.25	97	118	4.3	14.3
Atlantic	64	62	30	41	2.24	1.76	2.12	2.90	111	146	4.3	13.1
Cycloon	60	52	18	26	2.07	1.47	1.47	4.28	76	111	5.4	19.7
Kauka Gold(NY101)	64	--	--	--	2.46	1.58	1.12	3.47	104	146	5.0	12.9
Lady Christyl	43	--	--	--	1.45	1.45	1.14	4.20	90	118	3.0	15.6
Lady Claire	63	--	--	--	2.43	1.18	1.29	3.67	146	167	4.2	9.8
Lady Olympia	65	60	24	34	1.86	1.43	1.19	4.22	146	167	4.9	9.6
Shepody	62	46	20	32	2.42	1.83	1.26	4.21	111	146	2.4	8.7
Superior	58	--	--	--	1.01	1.68	1.68	3.76	111	132	3.2	12.4
Yukon Gold	60	--	--	--	1.80	1.80	1.13	3.50	153	178	3.7	7.4
AP1615-1	60	--	--	--	3.00	1.56	1.39	2.60	104	132	4.4	19.5
Waller Duncan LSD	3	5	4	12				0.81				
<u>Russet/Processing Trial:</u>												
Russet Burbank	59	52	26	37	1.96	1.33	1.25	-	167	205	3.7	5.0
Gem Russet	62	53	25	34	2.82	1.35	1.65	4.27	167	212	4.7	3.8
Russet Legend	65	52	32	42	4.08	2.58	1.83	3.47	160	188	5.1	5.9
R. Norkotah	55	47	19	28	1.29	1.29	1.24	4.70	146	167	4.6	6.3
R. Norkotah #3	50	43	22	32	3.73	1.27	1.36	4.25	153	188	4.5	4.4
R. Norkotah #8	55	44	20	28	2.92	1.08	1.08	-	153	174	4.1	4.8
Shepody	59	44	20	29	2.08	1.25	1.42	2.50	125	153	3.1	4.7
Umatilla Russet	60	52	31	37	2.54	4.85	2.38	4.33	146	167	4.2	8.0
A81386-1	62	57	36	53	3.25	1.58	1.42	4.75	153	174	4.2	7.1
A84118-3	64	55	24	34	6.50	1.19	1.25	4.02	174	212	5.3	5.3
A84180-8	58	47	20	31	2.08	2.38	1.08	3.90	174	212	5.0	3.9
A86102-6	57	39	26	32	4.31	2.06	1.31	3.71	160	205	5.5	5.9
W1099Rus	62	50	25	33	2.00	1.20	1.07	2.58	90	125	5.8	16.7
W1151Rus	60	51	26	37	3.00	1.07	1.07	3.55	97	139	5.7	10.0
W1348Rus	64	58	39	51	3.39	1.06	1.72	4.93	104	146	3.9	11.5
Waller Duncan LSD	3	4	3	9				1.13				

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Maine Table 16 cont.

- ¹Stored at 38°F, 45°F, or 50°F, 85% R.H. from harvest until January 31 to February 8, 2000. Chip color scores are from an Agtron Model M-35 Process Analyzer (Agtron, Inc., Sparks, Nevada; calibrated with black disk "0" = 0 and white disk "90" = 90). Chips were crushed and reported values are means from four replicate samples. Each sample was read three times and was thoroughly mixed between readings. Higher numbers indicate lighter chip colors.
- ²Reconditioned samples were taken from 38°F and placed at 70°F for a 3-week period starting on January 12, 2000. See Agtron description under footnote #1.
- ³Skinning and shatter bruise were measured on September 23 (earlies, mediums) or October 1 (lates, russets), 1999. Approximately 10 lbs of tubers that exceeded 1½" diameter were tumbled in a drum with three stones for 1 minute at 15 rpm. Tubers were then rated for skinning and shatter bruise. Data presented represent indices where: 1=all tubers have 0% of surface affected and 9=all tubers have 100% of surface affected. The tubers were then placed in 45°F storage and rated for internal damage on February 16 to 18, 2000 where: 1=all tubers have no visible internal injury and 5=all tubers have severe internal injury.
- ⁴Abrasive peel test for biochemical aspects of blackspot bruise potential (see Pavek et al, APJ 62:511-517). The late samples were run on January 12, 2000, while the rest were run from February 10-12, 2000. The index presented indicates the severity of discoloration where: 0=no tubers show discoloration and 5=all tubers have severe discoloration.
- ⁵Tubers were stored at 45°F, 85% R.H.
- ⁶Percentage sprout and weight loss following storage from harvest until March 21, 2000 at indicated temperature and 85% R.H. Codes "s" or "r" indicate heavily sprouted or samples with more than two spoiled tubers, respectively.

Maine Table 16 cont.

¹Stored at 38°F, 45°F, or 50°F, 85% R.H. from harvest until January 31 to February 8, 2000 Chip color scores are from an Agtron Model M-35 Process Analyzer (Agtron, Inc., Sparks, Nevada; calibrated with black disk "0" = 0 and white disk "90" = 90). Chips were crushed and reported values are means from four replicate samples. Each sample was read three times and was thoroughly mixed between readings. Higher numbers indicate lighter chip colors.

²Reconditioned samples were taken from 38°F and placed at 70°F for a 3-week period starting on January 12, 2000. See Agtron description under footnote #1.

³Skinning and shatter bruise were measured on September 23 (earlies, mediums) or October 1 (lates, russets), 1999. Approximately 10 lbs of tubers that exceeded 1 1/2" diameter were tumbled in a drum with three stones for 1 minute at 15 rpm. Tubers were then rated for skinning and shatter bruise. Data presented represent indices where: 1=all tubers have 0% of surface affected and 9=all tubers have 100% of surface affected. The tubers were then placed in 45°F storage and rated for internal damage on February 16 to 18, 2000 where: 1=all tubers have no visible internal injury and 5=all tubers have severe internal injury.

⁴Abrasive peel test for biochemical aspects of blackspot bruise potential (see Pavek et al, APJ 62:511-517). The late samples were run on January 12, 2000, while the rest were run from February 10-12, 2000. The index presented indicates the severity of discoloration where: 0=no tubers show discoloration and 5=all tubers have severe discoloration.

⁵Tubers were stored at 45°F, 85% R.H.

⁶Percentage sprout and weight loss following storage from harvest until March 21, 2000 at indicated temperature and 85% R.H. Codes "s" or "r" indicate heavily sprouted or samples with more than two spoiled tubers, respectively.

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE**EXHIBIT E**
STATEMENT OF THE BASIS OF OWNERSHIP

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) Wisconsin Alumni Research Foundation	2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER W1348	3. VARIETY NAME 'Millennium Russet'
4. ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP, and Country) 614 North Walnut Street P.O. Box 7365 Madison, WI 53707-7365	5. TELEPHONE (include area code) (608) 263-2500	6. FAX (include area code) (608) 263-1064
7. PVPO NUMBER #200100041		

8. Does the applicant own all rights to the variety? Mark an "X" in appropriate block. If no, please explain. ☒ YES ☐ NO9. Is the applicant (individual or company) a U.S. national or U.S. based company? ☒ YES ☐ NO
If no, give name of country10. Is the applicant the original owner? ☐ YES ☒ NO If no, please answer one of the following:

a. If original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. national(s)?

☒ YES ☐ NO If no, give name of country

b. If original rights to variety were owned by a company(ies), is(are) the original owner(s) a U.S. based company?

☐ YES ☐ NO If no, give name of country

11. Additional explanation on ownership (if needed, use reverse for extra space):

Applicant has received ownership from the assignment by the original breeder.

PLEASE NOTE:

Plant variety protection can be afforded only to owners (not licensees) who meet one of the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.
2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.
3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definition.

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0581-0055. The time required to complete this information collection is estimated to average 10 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs). Persons with disabilities who require alternative means for communication of program information (braille, large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD).

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**U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705**

**EXHIBIT F
DECLARATION REGARDING DEPOSIT**

NAME OF OWNER (S) Wisconsin Alumni Research Foundation	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country) P.O. Box 7365 614 North Walnut Street Madison, WI 53707-7365	TEMPORARY OR EXPERIMENTAL DESIGNATION W1348 VARIETY NAME Millennium Russet
NAME OF OWNER REPRESENTATIVE (S) Lisa V. Mueller	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country) Dykema Gossett PLLC 10 South Wacker Drive Suite 2300 Chicago, IL 60606	FOR OFFICIAL USE ONLY PVP NO NUMBER #200100041

I do hereby declare that during the life of the certificate a viable sample of propagating material of the subject variety will be deposited, and replenished as needed periodically, in a public repository in the United States in accordance with the regulations established by the Plant Variety Protection Office.


 Signature
 
 Date